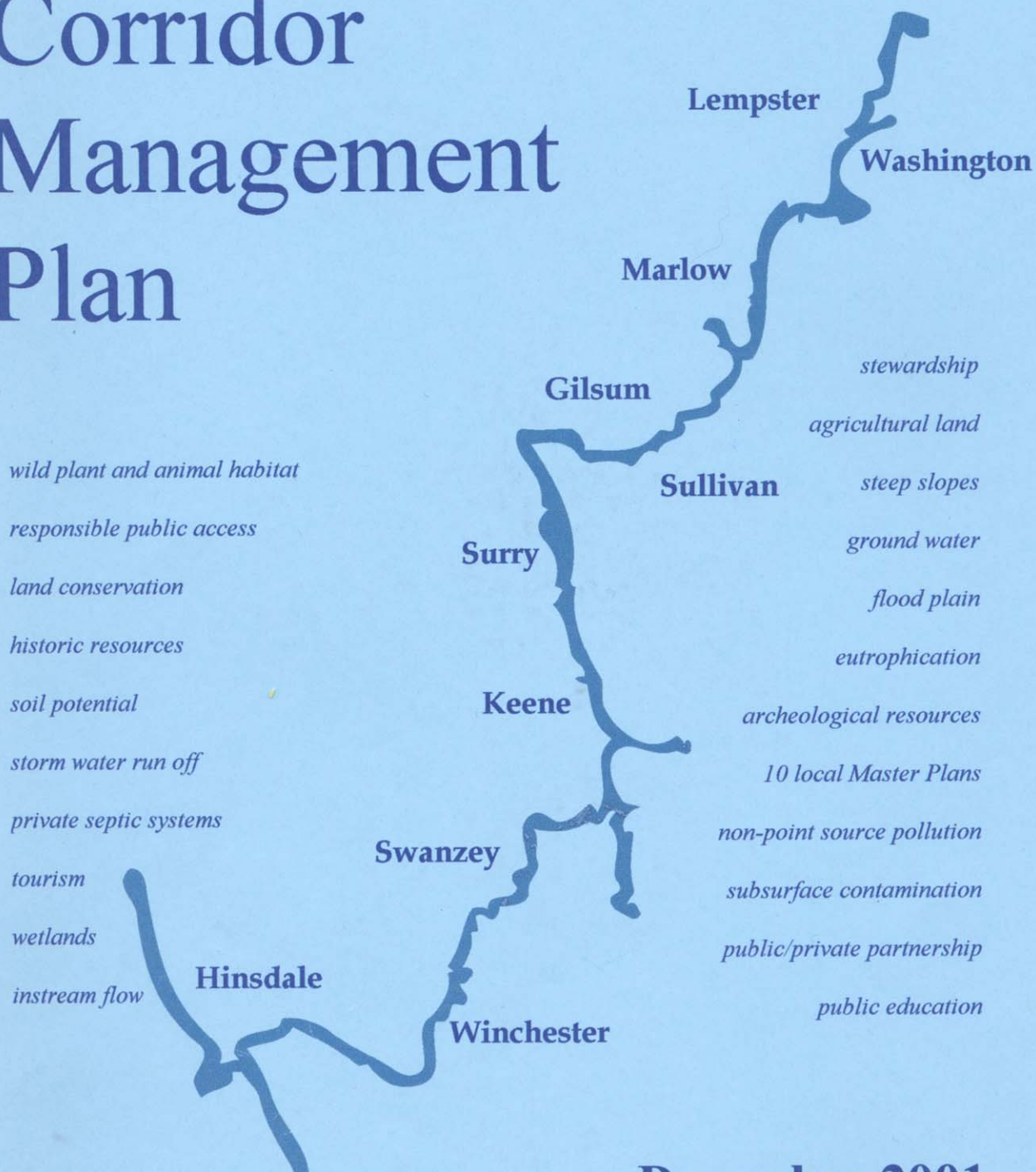


Ashuelot River Corridor Management Plan



December 2001

Table of Contents

Acknowledgments	ii.
Corridor Management Plan Mission Statement	iii.
Executive Summary	iv.
Glossary	ix.

River Management Plan

Introduction	1
Butterfield Pond, Washington to the Stone Arch Bridge, Gilsum	2
Stone Arch Bridge, Gilsum to the Stone Arch Bridge, Keene	5
Stone Arch Bridge, Keene to the Branch River, Keene	9
Branch River, Keene to the Mill Street Bridge, Winchester	14
Mill Street Bridge, Winchester to the G.E. Robertson Dam, Hinsdale	17
G.E. Robertson Dam, Hinsdale to the Connecticut River, Hinsdale	19

Appendices

Appendix 1. Management Tools	1.1 - 1.5
Appendix 2. Local Land Use Planning	2.1 - 2.4
Appendix 3. Annotated Directory of Assistance	3.1 - 3.8
Appendix 4. Regulations for Designated Rivers	4.1 - 4.5
Appendix 5. Land Use & Soil Conditions	5.1 - 5.10

Acknowledgments

The Ashuelot River Corridor Management Plan was funded by the NH Department of Environmental Services under Section 604(b) of the Clean Water Act, the Connecticut River Joint Commissions under the Connecticut River Partnership Program, and the Southwest Region Planning Commission.

The Plan was prepared by the Ashuelot River Local Advisory Committee (LAC) with assistance from the Southwest Region Planning Commission and the NH Department of Environmental Services Rivers Program.

The Ashuelot LAC acknowledges the professional contributions to the planning process of the following:

John Asseng, *US Army Corps of Engineers*
Bruce Clement, *UNH Cooperative Extension Service*
Beth Goettle, *US Fish and Wildlife Service*
Cliff Lerner, *Keene High School*
Jim Lewis, *US Army Corps of Engineers*
Jim MacCartney, *NH DES Rivers Program*
Al Merrifield, *City of Keene*
Frank Mitchell, *UNH Cooperative Extension Service*
Peter Newkirk, *USDA Natural Resources Conservation Service*
Gary O'Neal, *American Paper Service, Inc.*
Gary Pelton, *US Army Corps of Engineers*
Jeff Porter, *Southwest Region Planning Commission*
Barbara Skuly, author, *Ashuelot River Nomination Document*
Ken Sprankle, *NH Fish & Game Department*
Steve Stepenuck, *Keene State College and Ashuelot River Watch*
Jan Rowan, *US Fish and Wildlife Service*
Wendy Ward, *USDA Natural Resources Conservation Service*

Ashuelot River Corridor Management Plan

Ashuelot River Corridor Management Plan Mission Statement

The Ashuelot River and its corridor continue to experience pressure for increased development, recreation and other uses of its natural and cultural resources. This trend will likely continue in the future. It is essential to have a management approach that ensures a balance between protection of legitimate community interests and the rights of property owners along the river, in order to protect and improve the existing resource values of the River and its corridor.

The Ashuelot River Corridor Management Plan proposes a management approach with the mission of protecting plentiful clean water, thriving riparian and aquatic habitat for wild plants and animals, providing balance for continued development of land use and water uses, recreation, and other public needs.

The Ashuelot LAC presents the Ashuelot River Corridor Plan to local officials for consideration in the conventional local planning process, asking Planning Boards to review the Plan and adopt it as an adjunct to the local Master Plan. Planning Boards are encouraged to integrate recommendations from the Plan into local land use planning as they deem appropriate.

Ashuelot River Local Advisory Committee Membership 1994 - 2001

Barbara Skuly, Chairman (1999-) - *Swanzy*

Pat Eggleston, Chairman (1998-99) - *Keene*

Roger W. Sweet, Chairman (1994-97) - *Sullivan*

Bill Appel - *Keene*

John Asseng – Marlow

Carol Andrews - *Washington*

Michael Andrews - *Washington*

Roger Covey - *Hinsdale*

Bill Crowley - *Washington*

John Calhoun - *Gilsum*

Donald Damm - *Washington*

Pablo Fleischmann - *Gilsum*

Paul Gamache – *Winchester*

Malcolm MacDonald – *Surry*

Jo Beth Mullens – *Keene*

Glen Page – *Swanzy*

Gary Pelton -- *USACE*

Steve Poole – *Winchester*

Barbara Richter – *Surry*

John Salo – *Marlow*

Al Stoops -- *Keene*

Steve Stepenuck - *Swanzy*

Art Whipple - *Swanzy*

Planning Process

The Ashuelot LAC undertook a process of research and deliberation to fulfill the purposes of the Plan set forth above. LAC action began with review and discussion of the nomination document (prepared in 1992 for use by the General Court in consideration of the nomination of the Ashuelot River to the NH Rivers Management and Protection Program)¹. The nomination document is an inventory of natural and cultural resources that define the character of the River Corridor. Those resources are the reasons the people of the region value the River. While some of those resources are common to rivers around the globe, many are unique to the Ashuelot.

The Committee updated or revised the nomination document to reflect current conditions as understood by the LAC members. The LAC also weighted the importance of places, problems and opportunities by criteria such as the level of need or ability to affect action on particular issues.

Research also included expert presentations to the LAC on a variety of topics ranging from migratory fish restoration in the Connecticut River watershed to local subsurface contamination in Keene. (see Acknowledgments)

From these discussions and presentations the Committee found that the River can be described as a series of segments that vary from one another in land forms, development, and ecology. However, these segments blend together from the headwaters in Pillsbury State Park to the mouth of the Ashuelot at the Connecticut River. The Committee found it useful to delineate distinct segments for the purposes of understanding the River Corridor resources, threats to resource values, opportunities for use and protection of resources, and in general to develop a management approach for conservation of resources.

The basis for discussion was draft chapters of this Plan which described the natural and cultural features of segments which have relatively uniform characters:

- Butterfield Pond in Washington to Stone Arch bridge in Gilsum;
- the Stone Arch bridge, Gilsum to the Stone Arch bridge, Keene;
- the Stone Arch bridge Keene to the confluence of the Ashuelot and Branch Rivers in Keene;
- the confluence of the Branch to the Mill Street bridge in Winchester;
- Mill Street Bridge in Winchester to the G.E. Robertson Dam in Hinsdale; and
- G.E. Robertson Dam to the confluence of the Ashuelot and Connecticut Rivers in Hinsdale.

¹ Copies are available for review at Keene Public Library and the Southwest Region Planning Commission. Photocopies are available upon request and at cost from the Commission.

Findings

The committee recognized that several issues, including preventing non-point source pollution, managing public access to the corridor, and protecting soil are pressing throughout the River Corridor. The LAC also discovered many issues which are unique to individual segments of the River or even site-specific. Local issues typically involve historic resources, special plant and animal habitats, or subsurface contamination.

The character (and the management issues) of the River corridor change gradually from its headwaters in Pillsbury State Park to its mouth at the Connecticut. Protecting the values of undeveloped forest (wild plant and animal habitat, clean water, and marketable timber) dominate concerns through the headwaters segment. From Keene south to the Connecticut, cleaning up contaminated soil, protecting floodplain from development, and cleaning up storm water runoff are priorities for action. Public access to the Corridor is an important issue throughout the corridor as is the prevention of soil erosion and non-point source pollution.

Public education to develop stewardship of the Corridor resources is a top priority for LAC action. Other tools include local land use standards, existing state programmatic or regulatory standards, cooperation among private and public interests, and in some cases developing new programs at the state, regional, or local levels. The LAC supports a cooperative approach to resource conservation, an approach that acknowledges both the prerogatives of private ownership and the public benefit of regulating private activity to prevent loss of our shared natural and cultural heritage.

The LAC findings can be arranged in two groups 1) resources in need of conservation and 2) issues that call for management at the private, local, regional, and/or state levels:

Resource Conservation Issues:

- Water Quality Protection and Monitoring
- Public Access for Recreation in the River and Riparian Lands
- Conservation of Soil Potential
- Conservation of Plant and Animal Habitat
- Conservation of Green Space
- Conservation of Historic and Archeological Resources

Management Issues:

- Potential for Development of Private Property
- Growth of the Regional Tourism Industry
- Public Access for Recreation in the River and Riparian Lands

Finally, below (in no particular order) are descriptions of twenty issues which arose most frequently or were otherwise found to be priorities for action during the LAC's planning process.

Priority Management Issues in the Ashuelot River Corridor

1. Preservation of Plant and Animal Habitat. This includes upland, river bank and instream habitats. The Corridor hosts rare and endangered plant and animal species. Habitat protection also benefits the many far-ranging animals for which the unique river corridor is a part of their range (e.g. migratory songbirds, migratory fish, moose, fishers, and deer). Habitat protection in the River Corridor also includes the goal of maintaining natural riparian buffers. Preventing deforestation of river banks has profound benefits of protecting soil, water quality, open space, and plant and animal habitat.

2. Accommodating Responsible Public Access. There are several approaches to providing public access including publicly-owned access areas, public parking, encouraging private land owners to allow public access, and most importantly, public education regarding responsible use of private property and public resources.

3. Land Conservation. Protection of undeveloped land by purchase or donation of land or development rights. The benefits of land conservation are many and varied.

4. Preservation of Historic and Archeological Resources. The River Corridor has many historic places, buildings, and structures both in village centers and dispersed through uninhabited reaches of the River. Many are protected by state or local recognition, but many are not. Aside from the natural features of the Ashuelot, historic features may best define the character of the Corridor. Archeological resources are typically buried and unseen making them especially susceptible to accidental destruction during excavation.

5. Prevention of Soil Erosion. The loss of soil from construction sites, logging roads, or any unstable excavation site has dual impacts: 1) loss of soil potential on-site and 2) sedimentation of surface waters receiving the sediment. Excavation practices that reduce erosion, while commonly known and easily implemented, are too often not used.

6. Storm water Runoff Management. Snow melt and rain water carry sediment, plant nutrients, and toxic substances from construction sites, lawns and paved areas to surface water. Paved surfaces, especially those with car and truck traffic, including driveways, require special attention for preventing direct discharge of runoff to streams.

7. Surveillance and Enforcement Regarding Private Septic System Failure. Shoreland often hosts high-density development for seasonal and year-round housing. Release of pathogens, chemicals, and nutrients to surface water by failed or inadequate septic systems can have profound consequences for both human health and aquatic ecology.

8. Enhance Cooperation Among Local Government, Private Organizations, and Academia. There are many individuals and groups with interest, expertise and resources to act on River

Executive Summary

Corridor management issues. Networking among local government, schools, colleges, business organizations, and private conservation organizations improves the effectiveness of management.

9. Management of Tourism Development. Tourism can provide an economic incentive for conserving our natural and cultural heritage -- many travelers visit the Ashuelot Corridor because of its special features. But, over-exploitation of the Corridor's attractiveness can actually destroy those features by crowding them with incompatible development or literally trampling natural areas.

10. Public Education to Promote Stewardship. It is a proven dynamic that protection of any resource will become a way of life where there is a highly developed sense of shared ownership, appreciation, and responsibility for that resource.

11. Prevent Non-Point and Point Source Pollution. The release of pollutants into the air, water, and soil remains a problem wherever there is development. Each of us in our daily routines leave a trail of air pollution, waste water, and solid waste. It becomes clear that in order to prevent pollution we must modify our use of products and technologies that lead to creation of poisonous waste products.

12. Land Use Controls for Development on Steep Slopes. Soil erosion and loss of special habitats after poorly designed building or timber harvest on steep slopes are persistent threats in the area's uplands.

13. Protection of Ground Water (Stratified Drift Aquifers). The Ashuelot Corridor is the focal point of the River's watershed. The lower Corridor is underlain by rich sand and gravel deposits which supply the Keene, Swanzey, Winchester, and Hinsdale municipal systems today and represent tremendous water supply potential to other towns.

14. Preservation of Agricultural Land. Preservation of agricultural land is a difficult economic situation due to the high value of farmland for development. Farmland preservation has several benefits, including preservation of local agricultural potential, preservation of rural character, and protection of open space for habitat and landscape views.

15. Prevention of Eutrophication. Runoff of plant nutrients from lawn fertilizer and the effluent from waste water treatment facilities can lead to excessive plant growth in the River which in short term can lead to the consumption of free oxygen from the water when the plants decay. Warm water temperatures caused by loss of shade from deforestation of riverbanks also contributes to eutrophication. Eutrophication can be lethal to native aquatic animals and can also have human health consequences. Eutrophication can also lower market values of lake-front and river front properties.

16. Prevent Development of Floodplain Lands. The historic use of floodplain in the lower Corridor for farming did not preclude the hydrologic values of that floodplain. But, conversion of farms to residential, commercial and industrial development does. Building and paving on floodplains in the recent decades have led to a critical loss of flood water storage. Loss of flood storage has both economic and ecological consequences: flooding is worsened down stream and natural cycles of flooding (which create unique plant and animal habitat on floodplains) are lost.

Executive Summary

17. Integrate Corridor Management Plan with Local Master Plans. Many of the management issues identified by the LAC already appear in local Master Plans and less frequently, in local land-use standards. Inclusion of policies and measures to address these issues in local government for all ten Corridor towns is an important step toward fulfilling the goals of this Plan and the NH River Program.

18. Support Local Action to Clean-up Subsurface Contamination Sites. The high cost of cleaning up soil and ground water contamination finds municipalities relying on state and federal environmental funding programs. Competition for those funds is substantial. Regional support for municipal requests for funding can improve the likelihood of funding and the elimination of serious environmental hazards. There are high priority sites in Keene and Winchester.

19. Support NH Department for Environmental Services Instream Flow Regulation. The NH Department of Environmental Services is responsible under the NH Rivers Management and Protection Program for establishing rules for monitoring and maintaining minimum instream flow volumes for protected rivers, including the Ashuelot. Local understanding and support of local and regional activity will ensure successful implementation.

20. Prevent Loss of Wetlands. Loss of wetlands, like loss of riparian forest and floodplain, is known to have serious negative implications for biological diversity, water quality, and watershed hydrology. Wetland protection is equally important in upland and riparian settings.

aquatic ecology

the network of relationships between living and non-living things in streams, ponds, etc.; relationships based on the use of energy and material driven by chemistry and biology.

aquifer

geologic material, e.g. gravel, bedrock, or sand, which contains water beneath the earth's surface; while water is found in soil and rock almost everywhere, aquifers are isolated formations with enough water to supply human needs.

aquifer protection

practices, regulation, or engineering designed to prevent pollution of aquifers and the water contained in aquifers and prevent the depletion of water in aquifers.

aquifer, stratified drift

sand and gravel buried beneath the earth's surface which was deposited by running water in the prehistoric past; running water sorted the sand and gravel by the size of particles; stratified drift sand and gravel typically makes good aquifers because of space between particles 1) can fill with water and 2) allow water to flow through the deposit quickly.

best management practices (BMP)

guidelines for working with sensitive materials in sensitive areas to avoid damage to or loss of resources; can apply to soil excavation, manufacturing with chemicals, timber harvest, lawn care, etc.

cultural heritage

physical or intangible remnants of past ways of life, e.g. historic buildings or village settings, literature, music, technology, community events, etc.

cultural resources

physical features or characteristics of manmade or natural environments which contain, convey, or impart cultural heritage.

deforestation

literally: removal or loss of forest; in environmental management the term implies a trend of irrevocable conversion of land from forested to developed.

biological diversity

the variety of genetic material demonstrated in the variety of living things: bacteria, fungi, plants, and animals; each species represents a complete and unique combination of genetic material; extinction of species eliminates that genetic combination and its function in the ecosystem forever.

eutrophication

aquatic ecosystems depend on a balance of oxygen production with oxygen use: living plants make oxygen, living and decaying animals and decaying plants use oxygen; when plant growth is excessive (because of the addition of abnormally large amounts of plant nutrients, e.g. sewage or fertilizer) the decay that follows uses more oxygen than is produced causing an oxygen poor ecosystem.

floodplain

land regularly subjected to flooding during seasonal high water or other periodic flooding - typically flat land adjacent to the river banks; the landscape and plant life on floodplains are shaped by flooding.

flood water storage

diversion and retention of flood water away from stream channels during floods - typically as water spreads over floodplains and fills wetland rather than accumulating in the stream channel and increasing the height, speed, and power of flood water in the stream; water stored in floodplains and wetlands is released slowly to the stream or seeps into the ground.

free oxygen

oxygen molecules not combined with other chemicals in water or air; land and water animals need free oxygen for respiration.

green space

undeveloped land occurring either in natural undisturbed settings or as part of development design; may be vegetated with natural vegetation or landscaped.

ground water

water present beneath the earth's surface in spaces between particles of soil, sand, and gravel, and in bedrock fissures; ground water feeds streams and ponds.

habitat

the kind of place that provides a plant or animal species with what it needs to survive

and reproduce; these places are defined by geology, altitude, climate, and other plant

and animal species present; species may have very specific habitat requirements and be unable to survive under other conditions, or, species may be very flexible about habitat characteristics.

high density development

a subjective term implying areas where structures and impervious surfaces dominate the landscape, e.g. downtowns, shopping plaza, and apartment complexes.

hydrology

the study of the movement and behavior of water in the environment.

impervious surface

any surface through which water may not pass, e.g. asphalt, concrete, roof tops, and dirt packed by machinery.

impoundment

surface water retained by a dam; may be a stream impounded to create a pond, a natural pond enlarged by a dam, or a river elevated and widened by a dam.

LAC

a volunteer citizen group established by the Commissioner of the NH Department of Environmental Services to plan for the management of river corridors enrolled in the NH River Management and Protection Program.

Master Plan

documentation of policy and goals, existing conditions, and expected future conditions regarding land use, public infrastructure, and other public interests; typically prepared by local planning boards and are required for local zoning, capital improvements programming, and growth management.

migratory fish

fish species whose life cycle requires travel between fresh water of rivers and salt water of estuary or ocean to complete their life cycle; e.g. adult salmon live in ocean, return to streams to mate, eggs and young grow in streams, young migrate to ocean for adult life; adult female American eels live in streams and migrate to estuaries to mate, young migrate upstream.

minimum instream flow

volume of water flowing in a river designated in the NH Rivers Management and Protection Program needed to balance ecological & social needs of a river; flow volumes are specific to rivers, parts of rivers and seasons of the year; used to regulate water withdrawals from designated rivers.

non-point source pollution (NPS)

pollution not discharged to the environment from a single point, rather, from many sources over large areas, e.g. car exhaust, lawn care chemicals, and septic leachate.

nutrient

any of several chemicals required by plants for growth and reproduction: principally, phosphorous and nitrogen.

nutrient enrichment

release of excessive concentrations of plant nutrients into water; may originate from fertilizer applied to crops and lawns or from disturbance of forest soils and leaf litter which maintain a reservoir of nutrients.

public access

use of land or water areas by the general public; may be informal or specially designated.

rare and endangered species

endangered: plant or animal species at risk of becoming extinct in all or part of its range within NH; rare: plant or animal species at risk of becoming endangered in the near future; extinction can result when death of individuals occurs faster than reproduction, loss of habitat which prevents reproduction, or other barriers to reproduction, e.g. infertility caused by chemicals.

resource values

benefits provided by the use or simply the presence of resources.

riparian

describes land adjacent or near streams and rivers and linked with the river by hydrology and ecology; distance from stream will vary with the topography and land use - in very steep and rugged areas, only land very close to the stream will be considered riparian, in broad expansive valleys the river may influence land a mile or more from the bank due to flooding.

riparian buffer

undeveloped land adjacent to the river which retains natural or rehabilitated vegetation; riparian conditions are part of the stream ecosystem.

river basin

see watershed

river segment

see statutory river segment

sedimentation

the accumulation of sand, silt, or other sediments in the water and on the bottom of streams, pond, wetlands.

shoreland

land area within 250 feet of the water line of rivers and ponds pursuant to the NH Shoreland Protection Act.

site plan review

standards for information included on a plan for a proposed change of use or substantial expansion of an existing use.

soil potential

the ability of soil to support plant growth, either natural vegetation or crops; also, soil potential as a medium or substrate for construction or landscape.

Storm water runoff

water not absorbed by the ground, taken up by plant or animals, or retained in storage

which literally runs off the land surface into streams, ponds, and wetlands.

statutory river segment

NH Rivers Management & Protection Act establishes four descriptive categories for segments of rivers enrolled in the program based on the density of development near the river: natural, rural, rural/community, and community.

steep slopes

hillsides with a slope greater than 15%; steep slopes impose special engineering or cost requirements on construction and water management.

storm water

surface water accumulating from rain or snow melt.

storm water management

collection, diversion, conveyance, retention, and discharge of storm water; management implies measures to prevent sedimentation, non-point source pollution, flooding, and erosion.

subdivision

division of one property into two or more properties by legally recording a change on property boundaries with the county registry of deeds; local standards for lot dimensions and other characteristics of the land may affect the possibilities for subdivision.

surface water

any water existing on the land surface, e.g. puddles, ponds, wetlands, streams, etc.; also includes rain and snow melt spread over the land surface.

timber harvest

cutting and removal of trees from land for a domestic or commercial source of lumber, fuel, or other wood fiber use.

upland

land not associated with lakes, ponds, streams, or wetlands.

waste water

any water after use in domestic or industrial processes.

watershed

land area from which all surface water runoff drains at a single place; a watershed is the land area upstream from any point on a stream or drainage channel; boundaries of watersheds are determined by topography under natural conditions, but can be altered by engineering in developed areas with storm sewers; typically discussed for rivers (a.k.a. river basins), large streams, lakes, and ponds.

wetland

an area where the ecology is defined by the soil being saturated with water for at least part of each year; wetlands may also be adjacent to surface waters; types of wetlands include: marshes, bogs, fens, wooded swamps, and ephemeral pools.

zoning (ordinance)

local regulations controlling at least the kinds and densities (lot size and shape) of land uses allowed within a municipality.

zoning district

land area for which the permitted kinds and densities of land uses are established by local zoning ordinance; any municipality may have one or more use districts.

River Management Plan

- Introduction
- Washington - Gilsum
- Gilsum - Keene
- Keene
- Keene - Winchester
- Winchester - Hinsdale
- Hinsdale

Ashuelot River Corridor Management Plan

Status of the Corridor Management Plan in Town Planning

The Ashuelot River LAC developed the Ashuelot River Corridor Management Plan for use by the communities that share the River from its beginnings in Washington to its confluence with the Connecticut River in Hinsdale. The LAC's process included deliberation among its members, consultation with experts outside the Committee and, most importantly, discussion with local officials. The LAC's approach relies on adoption of the Plan by the ten municipalities for use in their respective land use planning and management.

The Draft Plan was provided for review to each of the ten Conservation Commissions, Planning Boards and Boards of Selectmen with a request from the LAC that the Planning Boards consider the findings and recommendations for inclusion in their municipal Master Plans. The LAC entertained all comments and requests for revision from local boards in order to ensure that the Plans could be integrated in local planning.

As of December 2001, the information, findings and recommendations of the Ashuelot River Corridor Management Plan have been formally acknowledged or adopted by the Planning Boards of eight of the ten Ashuelot River Corridor towns as follows:

The **Washington** Planning Board voted to take the information and recommendations of the Plan that are relevant to Washington under advisement in future community planning and land use regulation.

The **Lempster** Board of Selectmen finds the information and recommendations of the Plan important - but have not yet formally adopted or otherwise incorporated the Plan in community planning and land use regulation.

The **Marlow** Planning Board voted to take the information and recommendations of the Plan that are relevant to Marlow under advisement in future community planning and land use regulation.

The **Sullivan** Planning Board approved the Plan as an addendum to the Sullivan Master Plan.

The **Gilsum** Planning Board approved the Plan as an addendum to the Gilsum Master Plan.

The **Surry** Planning Board approved the "management goals and recommendations" of the Plan as a Conservation and Preservation Goal in the Surry Master Plan.

The **Keene** Planning Board, Conservation Commission and City Council incorporated information and recommendations from the Plan into an approved update of the Conservation element of the City's Master Plan. See inserted pages after page 13.

The **Swanzey** Planning Board finds that those parts of the Plan specific to Swanzey should be included in the body of the Swanzey Master Plan.

The **Winchester** Planning Board finds the information and recommendations of the Plan important and relevant to Winchester's community planning - but have not yet formally adopted or otherwise incorporated the Plan in community planning and land use regulation.

The **Hinsdale** Planning Board has not yet incorporated information or recommendations from the Plan into Hinsdale community planning and land use regulation.

About the Corridor Management Plan ...

This Plan was prepared in accordance with the New Hampshire Rivers Management and Protection Act (RSA 483:10). The Act establishes a program by which rivers or portions of rivers may be nominated by the communities sharing the river to the New Hampshire Legislature for enrollment in the protection program. The "protection" comprises enforcement of minimum instream flow volumes by the New Hampshire Department of Environmental Services and the establishment of a Local River Advisory Committee (LAC). The LAC is enabled to develop a river corridor management plan and review environmental permit applications for activities within the river corridor. The definition of the river corridor recommended by statute is the river channel and land within 1,320 feet (1/4 mile) or the landward extent of the 100-year floodplain, whichever is farther from the river bank. However, the LAC and river communities may otherwise establish boundaries as seen fit.

The Ashuelot LAC recognizes that the Ashuelot River and its riparian lands are valued by the river communities for many different reasons. Each reason is equally valid and important to its respective supporters. At times conflicts arise between goals and priorities for use of the river corridor by the community at-large, private property owners, commercial interests, and state and local regulatory powers. **The LAC prepared this plan to protect the river and riparian land for ecological and social values.** Ecological values include biological diversity and unique plant and animal habitat. Social values include recreation, scenic areas, aquifers for drinking water supply, flood water storage, river impoundments for hydropower, and developable land area. It is in this politically sensitive arena that the LAC developed recommendations for corridor protection that the river communities can support: to provide for competing needs without sacrificing river corridor protection to political compromise.

The purposes of this Corridor Management Plan are to:

- 1) document the condition of natural resources within the river corridor,
- 2) document the condition and trends in development and resource use within the river corridor,
- 3) identify threats to the quality (and even the continued presence) of those resources,
- 4) identify conflicts of resource protection and development within and between the river communities,
- 5) present recommendations to the communities that share the corridor for measures to ensure the conservation of natural resources and appropriate development within the river corridor,
- 6) provide the LAC with a context (technical and policy) for the review of permit applications within the corridor, and
- 7) protect the defining characteristics of the statutory river segments as established in the 1992 Ashuelot nomination document.

Summary of Issues

For the purpose of this Plan, the Ashuelot River begins at the outlet of Butterfield Pond in Washington, NH. Butterfield Pond is the fourth in a series of ponds that are the source of the River in the highlands near Mount Sunapee. North, Mill, May, and Butterfield Ponds are at the heart of 9,000-acre Pillsbury State Park which is in turn in the midst of vast tracts of undeveloped land. Much of the Ashuelot Corridor in the upper reach through the towns of Washington, Lempster, Marlow, and Gilsum is undeveloped. Scattered homes and public roads are the prevailing types of development. Residential development here is almost equally apportioned between permanent residences and camps or cottages.

Development intensifies on the shores of Ashuelot and Village Ponds and the riverbanks in the villages of Marlow and Gilsum, the River and dam sites are prominent features. Most of this upper reach of the Ashuelot is designated as natural or rural, with community designations in the villages of Marlow and Gilsum. Timber harvest and sand and gravel mining are common activities in this reach of the Corridor. The corridor land comprises a mosaic of private properties, with each property subject to landowner choice, local land use regulation, and regional economic trend. The natural and rural attributes of the upper reach are accordingly susceptible to change.

River Segment Designations: Butterfield Pond to Falls above Ashuelot Pond, 5 miles, **Natural**
 Falls above Ashuelot Pond to Symondsville Rd., 6.6 miles, **Rural**
 Symondsville Rd. to Village Pond Dam, 1.1 miles, **Community**
 Village Pond Dam to Blackstock Dam, 6.6 miles, **Rural**
 Blackstock Dam to Stone Arch Bridge, 1.1 miles, **Community**

Note: The Ashuelot LAC finds that the Ashuelot River watershed surrounding the natural segment is sufficiently confined and the landscape conditions are sufficiently homogeneous, that management planning under this plan should extend to the boundaries of the watershed in this segment.

Management Goals

As is the standard throughout the River, segment designations provide the underlying management criteria. There are few site-specific threats to the Corridor's resources in this upper reach. Management goals here include:

- protection or enhancement of the good-to-excellent water quality;
- preservation of wild plant and animal habitat;
- provision of recreational access to land and water;
- soil and other resource conservation practices in timber and sand and gravel extraction activities; and
- preservation of historic features including mill sites, the Stone Arch Bridge, and character of the Gilsum and Marlow villages.

Water Quality

The water quality in the upper reach of the Ashuelot River is very good, but threats exist today and may be compounded in the future. Protection of an intact forested **riparian buffer** and/or riparian wetlands will protect the river water from sedimentation, nutrient enrichment, and over-heating in Summer sun as well as slowing the flow of seasonal or storm flood waters. Incorporating standards to restrict the removal of soil, forbes, shrubs, and trees from river banks in subdivision and site plan review regulations is recommended. Town government and industry associations can make available guidance material and technical assistance for the implementation of Best Management Practices (BMPs) to **prevent soil erosion** during any alteration of terrain activity (e.g. logging, sand & gravel mining, road building, private property improvement, new site development). Likewise, **storm water management** to prevent pollution (sediment, pathogens, metals, chemicals, and nutrients) in village areas (Gilsum and Marlow) will be a substantial safeguard of river water quality. Local officials and landowner associations should monitor septic systems to **prevent pollution from system failure**. Septic pollution (nutrients, pathogens, and household chemicals) is a particular concern on the shores of Ashuelot, Long, and Sand Ponds and in the village areas of Marlow and Gilsum - places where the long history of dense residential development can harbor substandard, out-lived, or over-burdened systems. Surveillance for septic system failure and a policy for prompt corrective action is recommended for Boards of Selectmen. Local adoption of the land use standards prescribed in the **NH Shoreland Protection Act** should be considered by all municipalities on the upper reach. The UNH Cooperative Extension Service and NH DES provide guidance on this matter.

Natural Areas

Protecting natural areas that will provide refuge for the region's indigenous plants and animals is a challenge given the pattern of private property ownership. A **land conservation strategy** is required. A successful strategy will include cooperation among town governments, conservation organizations, scientific academia, and private landowners. The strategy will enable participants to identify important lands for inclusion in a network of lands protected from development. The entire upper reach has opportunity and need for land conservation, with many publicly owned or otherwise encumbered properties already in place. Land conservation is not an alternative to development and economic prosperity. It is part of a comprehensive plan to ensure a hospitable future. Conservation lands can also provide recreational opportunity and be part of local tourism development. Nearly all of the corridor's undeveloped, sparsely developed and agricultural lands are considered desirable for protection due to the high habitat value of riparian forests and wetlands. Local Conservation Commissions, local sportsman clubs, and organizations such as the Society for Protection of New Hampshire Forests, the Harris Center for Conservation Education, and the Monadnock Conservancy should be brought together for this.

Historic Resources

Like most of New England, it is difficult to throw a stone in the upper reach corridor without hitting something historic. Nonetheless, the Ashuelot LAC recommends focused stewardship efforts for several specific sites and areas. The upper reach has several **abandoned mill sites and dams**: between Mill and May Ponds in Pillsbury State Park, south of the Lempster-Washington Rd, the dam at Symondsville Rd sawmill, the dam for the Hodgeman's rake factory at Cohoos Pond, Marlow Village Pond hydroelectric dam, the Blackstock dam, and peg shop ruins above the Gilsum Gorge. Other significant historic features include **Gilsum Stone Arch Bridge** and **Jones Hall in Marlow** - both on the New Hampshire Historic

Register. The historic settlement patterns and architecture of the **Gilsum and Marlow villages** also contribute to the character of this reach. Local government is encouraged to cooperate with private and public interests to ensure protection of these historic resources, so that future development does not obliterate these links with the past. Steps can be taken to register historic features with local, state, or national historic preservation agencies. A key to preservation is stewardship of the resource - understanding its value and protecting those values everyday. Preservation does not preclude development, but ensuring the continuation of historic features will enrich development. Documenting the meaning of historic features is an important step to making them part of everyday life. Historic sites or areas can be identified in zoning and subdivision and site plan review regulations as **special use districts**.

Economic Resources

Zoning use districts should allow continuation of timber harvest and sand and gravel mining while also responding to possible tourism values. Zoning considerations should include preserving forested hilltops, identification of scenic views, encouragement of development compatible with scenic value, and allowing for tourist support businesses. Land conservation activity can also preserve timber, maple sap, and tourism opportunities. Tourism is an industry which can provide high local returns and help a rural area like the upper Ashuelot corridor make the most of what it has. Local Master Planning should make a special effort to identify the attributes of the river corridor, which will support tourism development.

Public Access & Recreation

Public access to undeveloped land and to the river itself is a valuable amenity in the upper Ashuelot corridor. It is essential that the needs of all parties involved be understood and respected. **Public education about land stewardship, responsible behavior in the outdoors on public or private land (including legal requirements), and places where access is permitted is essential to ensuring continued access to public and private lands.** Providing information to landowners is likewise important. In general, any activity that can ensure responsible behavior of the public and improve relations between the public and private landowners will be resources well spent. Providing public access to the river or corridor lands by way of trails or roadside access should also be part of the land conservation strategy.

Stone Arch Bridge, Gilsum - Stone Arch Bridge, Keene

Summary of Issues

This 14.5 mile reach of the Ashuelot, bounded on either end by historic stone arch bridges, is designated as **rural**. The River corridor varies from a precipitous gorge in highland forest at the Gilsum Stone Arch Bridge through a narrow steep-sloped valley in Surry to a broad flat plain through farm fields and floodplain forest in Keene. The river transitions from a high energy upland stream of rapids and riffles coursing downhill through boulders, stones, and forest to a gentle meandering river flowing through backyards, floodplain forest, and farm fields toward the Connecticut. Likewise, the management issues for the corridor transition here. Issues of the upper reaches above Keene are dominated by concerns about the impacts of resource extraction (timber, sand & gravel), preservation of unfragmented forest tracts, and protection of corridor resources from potential development. Beginning in Keene, threats from pollution, impairment of the floodway, and loss (absence) of riparian forest come to the fore as management issues. The special issue of endangered species habitat arises in Keene also, where a dwindling population of dwarf wedge mussels inhabits a site in the Ashuelot River bed. There are other local concerns in this reach, including the abandoned Gilsum town dump, Surry Mt. flood control dam and reservoir (with considerable federal land holdings), several miles of state road adjacent to the river banks, and nearly a mile of river meandering through a golf course in Keene. Water quality above the Surry Mt. Dam is considered very good. The flood control reservoir has uncertain impacts on downstream water quality and habitat. The suburban development arising in Keene introduces non-point pollution.

Management Goals

As is standard throughout the River Corridor, segment designations provide the underlying management criteria. There are several site-specific threats and issues in this reach. Management goals include:

- protection of good-to-excellent water quality;
- public access for instream recreation (e.g. canoeing, kayaking, fishing, swimming);
- maintain or rehabilitate forested riparian buffer;
- protect high value instream and riparian plant and animal habitats;
- reduce NPS threats: turf management (nutrients, pesticides, herbicides), storm water runoff, soil erosion (sediment and nutrients), and road salt impacts; and
- steep slope management to prevent erosion in logging and site development.

Water Quality

Ashuelot River water quality is considered to be very good between the Stone Arch Bridge in Gilsum and the Surry Mt. reservoir. The use of **road salt** on the River Road is a potential threat to water quality, although there is not yet available a definitive explanation of the ecological effects of road salt on stream water. There is concern that the water quality of the Ashuelot is adversely affected by the ecology of the **Surry Mt. reservoir**. Pollution of ground and river water with chemical fertilizers, herbicides and pesticides used for **turf management** on the Bretwood golf course is another water quality concern. This reach also hosts an increased level of sensitivity for ground water protection with significant stratified

Stone Arch Bridge, Gilsum - Stone Arch Bridge, Keene

drift aquifers in the Keene valley floor beginning below the Surry Mt. dam. Keene has enacted a wellhead protection program for its municipal well near the Cheshire Turnpike Stone Arch Bridge.

Public Access

Currently, there is informal public access to the river and riparian lands throughout much of this reach. The principal exception is Bretwood golf course. Few landowners feel compelled to post their land against public use. Access to the river for canoeing and kayaking, fishing, trapping, and hunting is enjoyed by residents and visitors. **Public education** to build awareness among river users of private landowner rights and user responsibilities that come with the privilege of access could ensure the continuance of this informal arrangement. Provision of **publicly-owned access areas** by municipal or state government is also recommended. Providing safe convenient parking as well as access rights-of-way to the river for river users could be provided by state and local government as with great ponds today. Note: Surry Mt. reservoir and its surrounding federal lands are a major public lands resource in this reach of the Ashuelot providing recreation and plant and animal habitat.

Riparian Buffer

Suburbanization and the Bretwood golf course have eliminated much of the trees and shrubs from the river banks below the Surry Mt. dam. **River bank deforestation** has the effects of riparian and instream habitat destruction and loss of runoff and floodwater moderation. Development that causes river bank deforestation usually precludes re-establishment of the riparian habitats, but, river banks can be managed to restore the shading effect of tree canopies on stream water in ways that are compatible with most suburban and recreational land uses. Private land owners are encouraged to plant and manage trees and shrubs to shade the stream. Standards prohibiting loss of riparian trees and shrubs can be included in zoning and site plan regulations.

Instream and Riparian Habitat

Instream habitat undergoes natural changes as the river levels and slows as it approaches Keene from the north. But the **Surry Mt. reservoir management** has a profound effect on the hydrology and on the natural seasonal cycle of change and stability in the streambed downstream from the dam. Reservoir management for flood control purposes must not obliterate the ecology of downstream habitat.

Riparian habitat upstream from the Surry village area is essentially upland forest growing on the stream bank. There are areas with small wetland inclusions and sand bars. At Surry Village and Surry Mt. reservoir the landscape changes: riparian lands begin to support floodplain habitats which are typified by red osier, alder, silver maple, and cottonwood growing on sandy soils that are subject to high water table and frequent flooding. Planning for natural area conservation and **greenway planning** can link Surry Mt. dam public lands with City of Keene park land.

Stone Arch Bridge, Gilsum - Stone Arch Bridge, Keene

Agricultural Land

The landscape and soils of the Keene valley floor (below the Surry Mt. dam) can support tillage crops, e.g. corn, fruits and vegetables, at a scale heretofore not possible - although the sandy loams are not prime agricultural soils. The corridor from Keene south has a history of agricultural development but now there are few active farms tilling only a fraction of the former farm land. Suburban and commercial development has displaced agriculture and late twentieth century economics of farming do not support small scale livestock or crop farming in New England. There is concern that loss of agricultural potential by development of farm land may incur a heavy price in the years to come. Preservation of agricultural potential can be accomplished by preserving unfragmented farm land for agricultural production or as natural areas. Local zoning can set aside conservation areas and encourage cluster development to prevent fragmentation of fallow farm land. Local and regional economic development efforts can assist local farmers maximize profits from local produce with the development of value-added products (such as preserves, sauces, and maple sugar).

NPS Sources

The rise of suburban development and increased density of the road network and other paved areas increases the impact of non-point source pollution (NPS) in this reach. Gasoline and other petrochemicals spilled from motor vehicles, particles of metal and other chemicals on roadways and parking lots, and the use of fertilizers and other chemicals for suburban lawn care endanger water quality and aquatic habitats. **Public education** targeting residents, business owners, and government officials about management practices for storm water management and the use of lawn care and petroleum products is recommended to minimize NPS impacts. **Riparian zoning setbacks** from the river for application of lawn care chemicals and **site plan standards** for storm water management systems and retention of trees and shrubs on the river bank can reduce the transport of NPS pollutants to river water. The corridor soils downstream from the Surry Mt. dam tend to be well drained sandy soils subject to seasonal flooding, with the water table near the surface. Water percolates downward quickly through these soils. Accordingly, there is a high potential for ground water pollution by substandard, over-taxed, or otherwise deficient septic systems. **Surveillance for septic system failure** by residents and local officials is recommended, as is a local government policy for quick remediation of known problems.

Steep Slopes

Development on hillsides with a slope greater than 15% can lead to soil erosion and increased storm runoff. The latter also means decreased infiltration of water to ground water. Increased runoff and decreased infiltration lead to impoverishment of ground water supplies for late summer and increase in flood waters during snow melt or rain storms. **Development on steep slopes is to be discouraged** via zoning and site plan standards unless extraordinary precautions to avoid erosion and runoff problems can be assured. Best management practices for prevention of erosion and sedimentation should always be part of site plan standards.

Stone Arch Bridge, Gilsum - Stone Arch Bridge, Keene

Site/Issue Specific Analysis and Recommendations

- Minimize reservoir and down stream water quality impacts of Surry Mt. reservoir
- Minimize down stream hydrologic impacts of Surry Mt. reservoir
- Protect scenic character of River Road
- Preserve natural amenities of the Gilsum Gorge
- Manage public access to Gilsum Gorge
- Integrate US Army Corps of Engineers Surry Mt. flood area land management goals with local and corridor wide goals (regarding plant and animal habitat and agricultural land)
- Integrate off-corridor land management goals re: Surry Mountain ridge and Greater Goose Pond area with corridor goals
- Understand and manage pollution threat posed by the old Gilsum dump
- Support the US Fish & Wildlife Service dwarf wedge mussel rehabilitation plan
- Support the Keene Wellhead Protection Program and aquifer protection measures
- Implement public education to control or eliminate of suburban NPS pollution; including the proper use and disposal of petroleum products; household chemicals, chemicals for lawn and golf course turf management, and road salt
- Provide for public access throughout the reach
- Promote awareness of timber harvest Best Management Practices and statutes in local government and industry
- Restore riparian forest and shade in Bretwood golf course
- Monitor shelved US Army Corps of Engineers plan for development of Hammond Hollow and Honey Hollow flood control

Summary of Issues

This **four-mile Community** segment is unique in the corridor for the intensity of urban development on its river banks. Urban features that affect River Corridor resources include:

- high percentage of land area covered by asphalt, concrete, and buildings;
- conveyance of runoff via storm sewers;
- industrial contamination sites;
- dense street and highway network with high traffic volumes;
- complex and aged sanitary sewer system;
- riparian recreation areas;
- dense development on land over extensive stratified drift;
- riparian natural areas (parks); and
- high population density.

These features are the bases for a suite of threats, damages, and demands that call for effective community action to protect Keene's Ashuelot River Corridor resources. The types of issues are not unique to this segment, but the level of threats, potential for loss, and level of competition between demands are greater here than elsewhere on the Ashuelot.

Brooks and storm runoff in Keene have been managed for hydraulic efficiency since the City's early days. Water is collected and channeled to the Ashuelot by pavement, rooftops, drains, ditches, culverts, and walled/diked stream channels to move as much water away from development as fast as possible and maximize the amount of land available for development. There are some negative effects associated with this approach, especially since Keene is situated on an area characterized by its hydrology: floodplain formerly dominated by wetlands at the confluence of many brooks. The negative effects of this management approach include impoverishment of ground water (by loss of opportunity for water to infiltrate into the soil in the City area), increased downstream flood hazard (by loss of flood water storage area), increased downstream erosion hazard (by increased discharge volumes and force in the River), and increased sediment load in the River water.

Non-point source (NPS) pollution, impoverishment of ground water, and increased flood hazard are direct consequences of impervious surfaces, channelization of runoff in storm sewers and ditches, and accidental or neglectful contamination of soil and water with pollutants from motor vehicles, lawn care, industrial processes, and sewage.

There are several areas in the City where former municipal or industry practices and accidents left extensive soil contamination. These pollution sites damage ecology and economics. Some of these sites are known but not well defined in terms of identities of contaminants or patterns of movement through the soil and ground water. Known contamination sites include underground gasoline spills, abandoned back lot industrial waste dumps, and former municipal dumps. These sites are of great concern to City government, residents, and conservationists. Former waste management practices, e.g. direct discharge of sewage and industrial waste into the River, also create the problem of contaminants "stored" in the sediments of the Riverbed and the possible persistence of some chemicals in plant and animal tissue.

Stone Arch Bridge, Keene - Confluence of the Branch, Keene

The River has recently enjoyed a renewed appreciation as a City asset. During the last two decades the River in Keene has become a stream of cleaner water bordered by park land and natural areas. A typical paradox has developed concurrently: increased popularity and appreciation of natural areas can lead to destruction of the various attributes, which make it popular by overuse. Walking, mountain biking, fishing, and canoeing throughout the Ashuelot River Park and Tenant Swamp areas have grown dramatically in late years. The combination of a high number of people respectfully using these areas and occasional inappropriate and damaging misuses is taking its toll on the appearance and character of the forests and river banks.

The several hundred acres of Tenant Swamp and adjacent public lands are not the only valuable habitats in this segment. The River bank through most of Keene hosts riparian and aquatic plants and animals. Beaver, muskrats, mink, fox, herons, waterfowl, partridge, shorebirds, myriad songbirds, and even deer can be seen regularly in the corridor north of West St. and south of NH 101. These "natural areas" are a great asset adjacent to downtown.

A new instream habitat appears in this segment also: flat water. Upstream from the Stone Arch Bridge in Keene, River habitats are mostly cold fast moving water riffles over gravel and stones and rapids coursing through boulders with interspersed pools. But here the nearly flat valley floor imposes a very low gradient and the river begins to meander, flow rates slow, bottom sediments become finer and deeper (sand, silt, and organic debris - "mucky"). Attendant changes in water characteristics include increased temperature, lowered dissolved oxygen and increased turbidity. There is a distinct qualitative change in the character of the Ashuelot River at the head of this segment which typifies much of the remainder of the River. The River is also impounded in Keene by the former Colony Mill Pond dam (the pond was reduced to the river channel by filling for development). The impoundment extends about three miles upstream from West St. River habitats include deeper water, lower oxygen content, and much more emergent vegetation. Red fin pickerel, creek chub, and sun fish are abundant here with pickerel weed beds, emergent grasses, and silky dogwood at the river's edge. The slower water coincides with increased sediment load entering the river from Keene's storm water runoff - contributing to higher turbidity and the accumulation of contaminants in River bottom sediments. NPS pollution prevention is essential to the protection of public health and instream habitats. Chemicals and metals can be toxic to humans, fish, wildlife, and plants. Sediment can obliterate stream bed habitats of plants, fish and other animals. Nutrients promote luxuriant plant growth which in turn consumes the available dissolved oxygen in the water when it decomposes - leaving the river impoverished for oxygen and possibly uninhabitable by native animals.

An extensive array of athletic fields for Keene State College begins in this segment (and continues in the next). The Keene State campus is a major riparian land use in Keene. The River adds to the park-like atmosphere of the college campus and is also susceptible to turf management and parking area runoff contaminants. Keene State's Science Division uses the River as a local environmental studies field laboratory - bringing important research and advocacy capabilities to River protection issues.

The abandoned, now state-owned Ashuelot rail line begins in Keene and runs the river banks from Keene to downtown Hinsdale. This corridor is currently under development as a multiple use public trail, although it has been used informally for many years for walking, biking, and ATVs. State and local involvement

Stone Arch Bridge, Keene - Confluence of the Branch, Keene

facilitated the replacement of several defunct railroad bridges crossing the River to provide a continuous trail from Keene to Hinsdale on this historic rail line. Other historic features include the industrial and residential development heritage throughout the corridor in Keene.

The River corridor in Keene is underlain with substantial sand and gravel aquifers, as is the entire Keene valley. Protecting this valuable resource and existing municipal wells is a priority in the City's land use and infrastructure planning. Keene has a Wellhead Protection Program in place for the municipal wells, including one near the Stone Arch Bridge.

Management Goals

- provide public access for instream and riparian recreation (e.g. canoeing, kayaking, fishing, swimming, walking, and biking) outside of City-owned lands;
- manage public access within City-owned park land;
- maintain or rehabilitate forested riparian buffer;
- reduce NPS threats: turf management (nutrients, pesticides, herbicides), storm water runoff and soil erosion (sediment, nutrients, sewage), and road salt impacts;
- describe the extent and nature of known subsurface contamination sites and expedite state and City clean-up programs;
- locate and repair leaks as may exist in the municipal sewer lines;
- preserve undeveloped floodplain areas;
- continue development and protection of Keene area riparian public land; and
- integrate corridor management and land conservation with existing Keene park land in and near the corridor, e.g. Goose Pond and Ashuelot River Park

Public Access

There are hundreds of acres of City-owned public land in this segment. Availability of public access for instream and riparian recreation (e.g. canoeing, kayaking, fishing, swimming, walking, and biking) is a problem. Outside of the City-owned land there is limited informal access. In the City's Ashuelot River Park careful management of public use is required to ensure that growing popularity does not compromise natural and cultural resource values. The Keene Conservation Commission, and private non-profit organizations: Pathways for Keene, Inc. and Friends of Ashuelot River Park can play essential roles in **public education and community stewardship** activities to minimize attrition of corridor resources by overuse.

Riparian Buffer

The **maintenance** of existing riparian forest and **restoration** of denuded river banks provides water quality, habitat, flood control, and scenic benefits. Riparian forests and wetlands are integral to greenway planning and habitat protection. Management and acquisition of public lands should proceed with goals for buffers and all attendant benefits as a priority. Corridor management and Keene area **land conservation** should be mutually integrated.

Stone Arch Bridge, Keene - Confluence of the Branch, Keene

Floodplain

Currently undeveloped floodplain in Keene is a premium asset for Keene and the communities downstream. The City should assertively discourage new development on undeveloped floodplain. Increased density of existing development on floodplain should be prohibited. Storm water management requirements for site development should consider flood mitigation as well as water quality. Aside from the flood mitigation and water quality benefits of natural floodplains, unique floodplain forest and wetland habitats are protected.

Water Quality

The water quality in this segment is officially rated as good by the state. However, the river water is subject to suburban and urban **non-point source pollution** (NPS): storm water runoff which introduces bacteria, nutrients, pesticides, herbicides, gasoline and other petrochemicals, and sediments (which may include heavy metals). The non-point source pollution threat can be mitigated with appropriate **storm water management** and **turf management** for both private and public properties. Soil erosion is less of a problem in this reach than elsewhere except for the conveyance of sediment-laden water from construction sites via the storm sewer system.

Subsurface Contamination Sites

The industrial heritage of Keene has left an unwanted legacy: subsurface contamination. Former back lot dumping of waste materials and chemicals by local industry and former municipal waste management practices have left several sites of buried pollutants in the corridor. These sites are known to exist but difficult to fully characterize in extent and constituency. Financial and human resources must be applied to the accurate definition of these environmental problems and the **expedient clean-up** of contaminants. Political will to expose and eliminate these problems must be developed locally and at the state level.

Specific Analysis and Recommendations

- Improve storm water management and reduce impervious surfaces associated with existing development
- Ensure appropriate storm water management and minimal impervious surfaces associated with expected commercial and industrial development at the Krif Road Industrial Park, the proposed Konover site, Black Brook Industrial Park, and Keene Bypass Improvements
- Continued support and funding of Keene's park land and open space development
- Community support for public education regarding stewardship of private and public riparian lands and the River proper, including the new Ashuelot River Park teaching site, Rachele Marshall Outdoor learning Center
- Management of Keene public lands to prevent destruction of resources by overuse or misuse by the public
- Inclusion of Keene State College, Antioch New England, and Keene public schools in

Stone Arch Bridge, Keene - Confluence of the Branch, Keene

corridor land use planning and resource management activities

- Community support for development and maintenance of the Ashuelot Rail Trail
- Determine and eliminate causative factors for the observed high coliform bacteria numbers in Beaver Brook and low oxygen concentration in the River
- Prohibit further development on Keene area floodplain
- Support municipal and private activities to remediate gasoline contamination under Emerald Street and the vicinity to the south
- Support municipal and private activities to remediate soil and ground water contamination as may exist in the vicinities of the former canal beneath the Center at Keene/Emerald Street, Keene Public Works property, southwest from Bradco Street, and Keene Landfill west of NH route 12 in Keene near Surry and Westmoreland.

Summary of Issues

This chapter addresses three river segments: a **6.1-mile Rural** segment between the confluence of the Branch River in Keene to the confluence of an unnamed brook at the north edge of West Swanzey village, a **1-mile Community** segment through the West Swanzey Village, and a **9.3-mile Rural** segment from the Denman Thompson Bridge in West Swanzey to the Mill Street Bridge in Winchester.

Both **rural** segments are mostly undeveloped floodplain as the river adopts the extreme meandering path of a mature river on the valley floor. The geomorphology and ecology of the riparian lands here are dominated by the millennial history of meandering and flooding. Access to much of this segment is impaired by its wetlands, thick shrub growth, many small tributaries, and oxbow ponds. These same characteristics make this segment a *de facto* wild area for plants and animals. Mount Cresson is a notable upland feature. Land use is limited to residential with several large tracts of hay field and pasture, but again, most of the segment is undeveloped. The Kelly family dairy farm is adjacent to the river near the southerly end of the Winchester segment, and there are several other locations where hay, pasture, or tillage approaches the river banks in Swanzey and Winchester.

Flat water canoeing and kayaking are popular here Spring through Fall. The Ashuelot Rail Trail runs near the river, crossing it twice - the “Ashuelot Line” is under development as a multi-use trail. The segment has plentiful undisturbed natural scenery visible from local and state roads. The historic Coombs Covered Bridge spans the river in Winchester just south of the Swanzey town line. A second historic covered bridge, the Slate Bridge, was destroyed by fire nearby in the Swanzey village of Westport and is currently being rebuilt. Two other covered bridges: Cresson and Thompson also span the Ashuelot in Swanzey. The river courses a short rapid through the ruins of a mill dam adjacent to Westport. NH route 10 runs parallel and quite near the river for several miles of the southerly rural segment and local roads ride the river bank throughout all three segments.

West Swanzey is a village with agricultural and industrial beginnings. Today there are a number of businesses and about 400 homes in the village. Most of the households there are served by municipal sewer. The Homestead Woolen Mills dam and the Thompson Covered Bridge are significant cultural features associated with the River in West Swanzey.

The following specific issues further characterize this rural segment.

- water quality suffers cumulative effects of sediment and upstream non-point source pollution;
- extensive stratified drift aquifers;
- riparian natural areas (undeveloped private land and conservation land including Yale Forest, Dickinson Forest, Mount Cresson, and the Muster property);
- Swanzey Master Plan identifies riparian land at north and south ends of town for future commercial and industrial development;

Ashuelot River Corridor Management Plan

The Branch River, Keene - Mill Street Bridge, Winchester

- eutrophication, high bacteria concentrations, and low oxygen concentration under summer low flow conditions;
- phosphorus loading from the Keene waste water treatment plant which adds to the large amounts of nutrients in the river sediment;
- development encroaching on scarce agricultural soils and farm landscape;
- potential for undetected effluent of untreated residential sewerage;
- various historic features, including the Cresson, Thompson, and Coombs covered bridges;
- state threatened species: Blue-gray Gnatcatcher (warbler), Sprout muhlenbergia and Long-fruited anemone, and state endangered Wild Sensitive Senna (*Cassia nictitans*); and
- paleo-Indian archeological sites.

There is another condition arising in the northerly rural segment. The River channel is filling with sediment. The low gradient in this segment (i.e. the River is flowing through relatively flat land so the water flows languidly and does not have the power to move material), the high sediment load from upstream storm water runoff, and attenuation of annual runoff peaks by Surry Dam flood control management (i.e. the River does not flood as high in the spring or during other big runoff events, rather, the runoff from upstream is stored in the reservoir and released slowly and not allowed to spill onto the floodplain) is filling the River channel with sediment. Without the flood control structures at Surry Mountain and Otter Brook, the River would have periods of flooding, especially spring snow melt, when the river water would scour out sediment deposited in the River bed since the last flood and move it downstream or deposit it on the floodplain areas. That has not been happening since those two flood control dams were installed. Sediment washed into the River upstream settles to the bottom in this slow moving water and is not removed.

Effects of this situation are several: disruption of ecology of the River water, River bed, and floodplain; reduction in volume of the river channel; and accumulation of pollutants in River bed sediments.

Management Goals

- Reduce nutrient load from upstream, segment riparian land, and the Keene waste water treatment plant.
- Reduce chemical pollutant load from upstream, from riparian land in this segment, and the Keene waste water treatment plant.
- Reduce sediment load.
- Monitor water quality on a regular basis, e.g., quarterly or annually.

- Manage Surry reservoir to augment summer low flows.
- Preserve historic and archeological features.
- Ensure responsible public access to River and natural areas.

Site/Issue Specific Analysis and Recommendations

- Ensure appropriate storm water management and minimal impervious surfaces associated with expected commercial and industrial development on riparian lands
- Continued support of private and municipal land conservation
- Community support for public education regarding stewardship of private and public riparian lands and the River proper, including cooperation with the Monadnock Regional School District
- Monitoring and management of public use of Ashuelot Line Trail to prevent destruction of resources by overuse or misuse by the public
- Inclusion of Monadnock and Winchester School Districts in corridor planning and stewardship activities
- Community support for development and maintenance of the Ashuelot Rail Trail
- Determine and eliminate causative factors for the observed high coliform bacteria counts, nutrient load, and sediment load
- Discourage development on floodplain lands
- Protect intact riparian “natural areas”, e.g. oxbow/wetland/floodplain forest systems

Ashuelot River Corridor Management Plan

Mill Street Bridge, Winchester - G.E. Robertson Dam, Hinsdale

Summary of Issues

This chapter addresses two classification segments: a **1.2-mile Community** segment through Winchester from the Mill Street bridge south to the NH 119 bridge followed by a **5-mile Rural** segment west from the NH 119 bridge to the dam site formerly owned by G.E. Robertson and Company in Hinsdale.

The Winchester village area is compact and developed immediately on the river bank with several hundred feet of building foundations that are actually at the water's edge. There are several small manufacturing businesses in the village area corridor, also retail businesses and residential apartments. Storm water runoff is an issue here from parking areas and local streets near the river bank. The now abandoned AC Lawrence leather tannery is a site of great interest to the town of Winchester for redevelopment for industrial use. The property has a waste water treatment facility near the river bank just downstream of the Mill Street bridge. The property's soil was treated under the EPA Superfund program for contamination by metals and acids used in the Lawrence tannery. A dam formerly used for log storage ponds the River in the village, but water level is not controlled. An historic steel truss bridge was recently replaced at Elm Street in the center of the village. Winchester also has a municipal waste water treatment facility at the southern end of the community segment. The Town of Winchester owns a 180-acre parcel of conservation land at Snow Brook. The Ashuelot Rail Trail travels on the southern river bank from Hinsdale through Ashuelot Village then crosses the River and continues through downtown Winchester where it turns north toward Westport Village. Mirey Brook enters the River just upstream from the NH 119 bridge. Mirey Brook drains from an extensive wetlands complex in nearby Sunny Valley and is also a fish release site for the Connecticut River Atlantic Salmon Restoration Project. A substantial stratified drift aquifer under Sunny Valley extends into the River corridor.

The physical geography of the River corridor changes with the transition from the community to the rural segment: meandering channel in floodplain/wetland forest to a steeper grade with swift current in a boulder strewn channel through upland forest.

The rural segment from the NH 119 bridge to the G.E. Robertson dam site has very little development. The village of Ashuelot hosts the historic Ashuelot Covered bridge and several dozen homes on both sides of the River, about half of which are on the river bank or on the opposite side of NH 119 (which runs on the river bank on and off for several miles) from the River. Ashuelot village homes and businesses on the north side of the River are serviced by the Winchester waste water treatment plant.

There are also two paper mills on the river's banks in Ashuelot and two active hydropower dams. There is also a proposal under consideration by the Federal Energy Regulatory Commission for the construction of a new dam upstream from the two existing dams.

Other special features of this segment include class II through IV rapids which attract canoe and kayak enthusiasts from throughout the country, the state endangered plant species Spiked needlegrass (*Aristida longespica* var. *geniculata*). The southern border of Pisgah State Park also falls within the Corridor.

Management Goals

- Prevent sedimentation, nutrient loading, and pollution from storm water runoff in the Winchester village.
- Prevent nutrient and pathogen pollution from the Winchester waste water treatment plant.
- Reduce sediment load.
- Monitor water quality on a regular basis, e.g., quarterly or annually.
- Preserve historic and archeological features.
- Ensure responsible public access to River and natural areas.
- Support NH Fish and Game and US Fish and Wildlife Service Atlantic Salmon Restoration Project regarding eliminating water quality barriers and physical barriers to migratory fish passage and reproduction in the Ashuelot River and its tributaries.

Site/Issue Specific Analysis and Recommendations

- Ensure appropriate storm water management and minimal impervious surfaces associated with expected commercial and industrial development on riparian lands. Continue support of private and municipal land conservation
- Community support for public education regarding stewardship of private and public riparian lands and the River proper
- Monitoring and management of public use of Ashuelot Line trail to prevent destruction of resources by overuse or misuse by the public
- Inclusion of Winchester School District in corridor planning and stewardship activities
- Community support for development and maintenance of the Ashuelot Rail Trail
- Discourage development on floodplain lands
- Protect intact riparian “Natural areas”, e.g. wetland and floodplain forest system
- Support removal of physical barriers and water quality barriers to migratory fish passage and reproduction in the Ashuelot River and its tributaries

Summary of Issues

This chapter addresses two classification segments in Hinsdale: a **1-mile Community** segment from the G.E. Robertson dam site through downtown Hinsdale to the NH 63 bridge followed by a **1.5-mile Rural** segment west from the village to the confluence of the Ashuelot River with the Connecticut River.

The physical geography of the River corridor changes again here, leaving the narrow steep river channel of the previous segment and opening into a wider low-gradient river flowing over cobbles and sand. The River bank throughout these last two-and-a-half-miles has a variety of land cover types: upland forest; floodplain forest; impervious surfaces of buildings, pavement, and retaining walls; or rural residential development with lawns, roadsides, and pasture.

The corridor in the vicinity of the confluence hosts a variety of riparian, floodplain, and wetland habitats for plants and animals. There is also a suite of conditions in the area which leads to open water year round on the Connecticut here which attracts a concentration of waterfowl and raptors including bald eagles. Peregrine falcons have also been seen in the confluence area. Connection of the homes upstream in Ashuelot to the Hinsdale waste water treatment plant and the installation of the Hinsdale waste water plant are part of the recent restoration of water quality in this part of the River to Class B. Water quality improvements to the Connecticut and Ashuelot Rivers make possible sport fishing at the confluence where fish species include walleye, northern pike, small mouth bass, and large mouth bass.

The Fort Hill Line Rail Trail crosses the Ashuelot within yards of the Connecticut River. The Ashuelot Rail Trail comes from the south to run on the south bank of the Ashuelot River from just east of Hinsdale village upstream to Winchester. Both of these former rail road corridors are now owned by the State of New Hampshire for use as multiple-use trails or other future transportation system needs.

Another aspect of the confluence of these two rivers is the coincidence of both being enrolled in the NH River Management and Protection Program. The Ashuelot LAC's planning process overlaps with the planning of the Wantastiquet Local River Subcommittee of the Connecticut River (one of five subcommittees on the Connecticut). The Wantastiquet group also identifies the confluence area as valuable aquatic, riparian, and inland habitat and notes the significant historic and archeological resources of the Hinsdale area. The Vernon hydroelectric dam just a mile upstream on the Connecticut is also a significant feature in the Connecticut corridor.

One of three U.S. Geologic Service gauging stations on the Ashuelot is near the confluence with the Connecticut. The other two are at Surry Mountain dam and the Woolen Mills dam in West Swanzey. Monthly discharge data have been maintained for the Hinsdale station since 1904. The average annual discharge of the Ashuelot through 1995 (latest published records) is 676 cubic feet per second (cfs), or about 5,000 gallons per second. This discharge rate roughly translates to about 160,000,000,000 gallons which falls onto the Ashuelot watershed each year. The lowest rate of discharge was 12 cfs in September 1929, the highest was 16,500 cfs in March 1936 and 50% of the past 92 years have had an average discharge rate of 376 cfs or more.

G.E. Robertson Dam, Hinsdale - Connecticut River, Hinsdale

The G.E. Robertson Dam once diverted river water to a canal for hydroelectric power generation and the Fiske Hydro Inc. dam in the village is an active hydroelectric generation facility. It is a run-of-the-river impoundment. The River is known to have been virtually dry in the village area for short periods during late summer. There is no consensus about the cause of this de-watering.

Other special features of this segment include:

- the Hinsdale Post Office is the oldest continually operating post office in the U.S.;
- state endangered plant species: Three-leaved black snakeroot (*Sanicula trifolia*), Burgrass (*Cenchrus longispinus*), Marsh horsetail (*Equisetum palustre*), Flatstem pondweed (*Potamogeton zosteriformis*), and Knotty pondweed (*Potamogeton nodus*).
- Fort Hill, a Squakeag Indian fort archeological site from ca 1640 located north of the mouth of the Ashuelot.

Management Goals

- Prevent sedimentation, nutrient loading, and pollution from storm water runoff in the Hinsdale village
- Prevent nutrient and pathogen pollution from the Hinsdale waste water treatment plant.
- Ensure maintenance of safe minimum instream flow conditions.
- Monitor water quality above and below the village area.
- Preserve historic and archeological features.
- Preserve diverse contiguous riparian and corridor plant communities.
- Ensure responsible public access to River and natural areas.
- Support State and Federal programs to eliminate water quality and physical barriers to migratory fishes.

Site/Issue Specific Analysis and Recommendations

- Ensure appropriate storm water management and minimal impervious surfaces associated with expected commercial and industrial development on riparian lands
- Continued support of private and municipal land conservation

G.E. Robertson Dam, Hinsdale - Connecticut River, Hinsdale

- Community support for public education regarding stewardship of private and public riparian lands and the River proper
- Monitoring and management of public use of Ashuelot and Fort Hill Line trails to prevent destruction of resources by overuse or misuse by the public
- Inclusion of Hinsdale public schools in corridor planning and stewardship activities
- Community support for development and maintenance of the Ashuelot and Fort Hill Line Rail Trails
- Discourage development on floodplain lands
- Protect intact riparian “natural areas,” e.g. wetland and floodplain forest systems
- Facilitate fulfillment of migratory fish restoration goals, e.g. removal of physical barriers to fish migration and restoration of seasonal hydrologic cycles.

Appendices

- Management Tools
- Local Land Use Planning
- Annotated Directory of Assistance
- Regulations for Designated Rivers
- Land Use & Soil Conditions

The Ashuelot LAC recommends the following non-regulatory approaches to manage public and private activity for the purpose of preventing or minimizing environmental damage from routine activities in our towns, industry, country neighborhoods, and forests.

Public Education

There is a proven relationship between people's understanding of the workings and values of the natural environment with their willingness to live their daily lives in ways that protect the health of our environment. Effective public education can take many different forms and consist of many different messages. Interested groups or individuals are encouraged to move ahead with their ideas and not hesitate to begin with modest efforts.

- Provide information to stimulate critical thinking about connections between routine activity and consequences which may not be apparent to most citizens, business owners, or public officials.
- Very basic information such as a diagram of the water cycle or a description of the poisons kept under most kitchen sinks can stimulate critical thinking about how each of us affects environmental health.
- Public education is about enabling people to make changes. Make the alternatives to damaging or dangerous activities and materials plain to the audience.
- Likewise, positive messages should be part of a public education campaign. Bring local history and natural features to residents' attention, or describe the activities of area conservation organizations and how residents can be involved.
- Avoid overloading the audience with details. Present the fundamentals with enough detail to clarify and make it real. And, always provide the audience with contacts or other ways to get more information to get involved.

Information enlightens and empowers. Most of us want to do what is right for our own welfare and to be good neighbors. Public education for conservation and environmental protection can give people the information they need to do that. There is no end to the need for public education.

How to get information to people . . .

Many towns have local newsletters, printed monthly or quarterly. These will usually print public education materials.

Single page fliers can be very effective. Local business leaders or civic groups are often willing to defray the cost of printing and postage when the fliers acknowledge their generosity. Printed fliers can also be made available at public places (libraries, post offices, schools, town meeting, etc.) and private gathering places with permission (e.g. stores, taverns, fraternal organizations, etc.)

Workshops, seminars, or guided walks featuring speakers or instructors from any of the many conservation agencies and organizations (Appendix 4.) are often very popular and can be held in conjunction with other community activities such as meetings of local groups or town government. Presentations can also be made by local experts or enthusiasts.

Public involvement activities, e.g. canoe trips, bird watching, wildflower walks, trail maintenance, and roadside clean-up are excellent ways to build appreciation for local environmental conditions and the values of natural resources.

Assistance for designing and conducting public education ...

Discussing your public education ideas with local teachers, school principals, or school district staff can provide access to the very important audience: students. Ask local teachers about their curriculum and discuss the inclusion of conservation ideas and awareness of local resources in their classroom activities. These meetings can create a tremendous flow of information and ideas both ways. Many public schools have innovative and effective approaches in place.

Keene State College has primary and secondary education, geography, and environmental studies programs which can provide student interns for a variety of research and outreach activities. Likewise, Antioch New England Graduate School has programs in environmental studies, resource management, environmental education and communications. Internships are a required part of Antioch's degrees and the School has provided many excellent interns to environmental projects throughout the Ashuelot corridor. The Harris Center for Conservation Education and Stonewall Farms both conduct ongoing environmental education programming and can provide professional advice in designing and conducting public education.

Public education for conservation and environmental protection is eligible for funding under some private and public grant programs. Grant funds can enable the development of highly effective publications, seminars, videos, or radio messages and the use of professional communications and conservation services. The Connecticut River Joint Commissions Partnership Program, NH DES Non-Point Source Program, and the McCabe Foundation are potential sources of grant funds.

See the descriptions of organization and agency activities in Appendix 3.

Best Management Practices to prevent damage from Timber Harvest, Soil Erosion, Storm water Runoff, and Potential Contamination Sources

Environmental agencies and industry associations have developed sets of guidelines to be used during activities that disturb soil and terrain, re-route surface water runoff, or involve the handling of chemicals that will be pollutants if released into the environments. Rather than prohibit activity that has the potential to harm environmental and public health, public policy supports managing those high risk activities to prevent or minimize environmental harm. The guidelines for managing high risk activities are known universally as Best Management Practices or BMPs. **BMPs can be part of advisory public education, or, BMPs can also be required as part of other permitting or regulatory processes.**

Timber Harvest

There are several authoritative sources for timber harvest BMPs. The NH Dept. of Resources and Economic Development, the NH Timberland Owners Association, the Society of the Protection of NH Forests, and UNH Cooperative Extension Service all provide publications of these BMPs, which are principally aimed at preventing soil erosion and minimizing damage to the remaining timber stand. The Society has also produced a publication and video on the subject of timber harvest aesthetics.

Timber harvest BMPs address construction and reclamation standards for landings and skid trails. Slowing runoff over exposed soil, reducing loss of forest soil to erosion, and preventing sedimentation of surface waters are primary goals during and after harvest.

- Careful planning for the location and grade of landings and skid trails to minimize slopes where soil is exposed;
- Installation of water bars to divert runoff from the trails rather than allowing trails to become stream beds during storms and spring snow melt;
- Using culverts, bridges, or fords made of limbs at stream crossings on skid trails and truck roads are called for during logging.
- Reclamation practices include restoring original slopes and seeding exposed soil with grass mixtures.
- Measures to reduce damage to residual timber stand include careful felling and skidding as well as intelligent planning of skid trails.

These kinds of measures require some planning and additional costs but in the long run protect the health of the timber stand and the forest ecology. The goal is to attain harvest goals with the least possible impact on the rest of the forest.

Soil Erosion on Construction Sites

Soil erosion during construction with excavation and road building can damage nearby streams and ponds by clouding the water, covering the bottom, and adding excessive nutrients to the aquatic system. Erosion also means the loss of valuable soil from the site.

During construction while the soil is protected by plants or other cover, erosion can best be checked by trapping runoff in basins dispersing it across open flat areas to reduce to the speed of the water which will allow the soil to settle to the ground. Silt fences made of hay bales or synthetic mesh both slow soil-laden water to allow settling and filter soil out of running water. Another approach is to avoid grading or piling dirt to create steep slopes which can become rushing streams during rainstorms carrying away tons of soil.

Requirements for erosion and sedimentation control measures are common elements of site plan review regulations and the State's Site Specific or Alteration of Terrain permit. The USDA Natural Resources Conservation Service is an excellent source of assistance regarding erosion and sedimentation BMPs.

Storm water Runoff

Storm water runoff from pavement and rooftops poses two threats to a river system: 1) increased amount of water draining to streams which will increase the magnitude of flooding downstream and decrease the amount of water soaking in to the soil and recharging ground water and 2) transport of chemical pollutants in solution or as sediment directly from pavement to streams. BMPs for storm water management are designed to slow runoff, allow water to infiltrate into the soil on-site, and allow sediment to settle out before runoff leaves the site. A common and effective system directs runoff into grassy swales and retention basins. Systems can also provide a means of removing contaminants on-site, e.g. uptake by aquatic plants in a treatment lagoon. Storm water management is a common element of site plan review. The USDA Natural Resources Conservation Service is an excellent source of assistance regarding erosion and sedimentation BMPs.

Potential Contamination Sources

Potential contamination sources (PCSs) are places where the storage, handling, use, or transportation of regulated substances in regulated quantities take place. The US Environmental Protection Agency has listed dozens of chemicals that are toxic to plant and animal life if released into the environment. These chemicals are regulated by federal and state agencies when

ever they are found in “regulated quantities”. For example, the transportation and storage of fuel oil is regulated only in quantities of 1,100 gallons or more. Some regulated substances are regulated when 10 or 15 pounds are used. To help build a local awareness of the hazards of PCSs, best management practices for PCSs have been developed to provide local officials some yardstick by which to assess the conduct of local businesses or other activities in handle potential contaminants. These BMPs were designed in conjunction with the Ground Water Protection Act and the Wellhead Protection Program. PCS BMPs can also be advised for non-regulated threats, such as unregulated quantities of toxics or for non-regulated substances such as livestock manure.

PCS BMPs address weather proof storage; keeping spillage or waste from regulated substances contained and preventing release into sewers, soil, or runoff; and having an emergency response plan that dictates a chain of contacts and actions in the event of an accidental release.

Planning Commissions and NH DES are sources of assistance regarding BMPs for potential contamination sources.

Conservation Easements

Concern for the fate of undeveloped land is prevalent among residents and municipal boards in the Ashuelot River Corridor. Preventing or restricting development by regulation is contentious and can be unfair to property owners; land is capital and each land owner is entitled by constitutional law to a reasonable economic return on their investment in land. There is also legal precedent for the existence of a valid public purpose in the protection of wilderness and other undeveloped land. The public benefits include preservation of biological diversity, protection of drinking water supplies, conservation of timber supplies, and the simple fact that green space makes people feel good.

An equitable way to provide the public benefits of open space without imposing economic hardship on landowners is the use of conservation easements to protect land from development. Conservation easements are legal mechanisms by which a buyer pays the landowner value of the land’s development potential. That is, the difference between the value of the land at full development potential and the value of the land with limited or no development potential. The landowner can retain ownership of the land but is legally bound by a deed restriction against developing the land. The easement can be purchased by any private or public entity with legal standing to expend funds and own property.

The Monadnock Conservancy, the Society for the Protection of NH Forests, the Nature Conservancy, the Audobon Society of NH, and the NH Dept. of Resources and Economic Development all facilitate, purchase, and/or monitor conservation easements in the Ashuelot River Corridor. Municipalities and property owner associations can also purchase easements. The Harris Center for Conservation Education, the Monadnock Sunapee Greenway Committee, and Monadnock Perspectives participate in coordinated planning for land conservation. See Appendix 4. for assistance contacts.

Ashuelot River Corridor Management Plan

Appendix 1. Management Tools

Easements can also be donated by landowners. Donation can provide landowners with various tax advantages. And, of course, outright purchase of land for conservation is another alternative.

There are also innovative zoning systems that allow trading of development credits between zoning districts to allow higher density development in one zoning district in return for limiting development in another. The burden of financing that trade-off falls on developers. This is an alternative to easements or purchase, which does not require the municipality or conservation group to raise funds.

Roles of Local Boards & Offices

Note: The synopsis of each board or office is followed by reference to New Hampshire legislation by which each is established and empowered as Revised Statutes Annotated (RSA) Chapter Number.

Town Meeting / Local Legislative Body / Voters

The voters residing within the political boundaries of a NH Town are collectively known as the Local Legislative Body. For all practical purposes, the Local Legislative Body acts at Town Meeting - either annual meetings or special meeting convened for emergency matters. All local ordinances and codes must be ratified by the Local Legislative Body. Voting takes place by ballot prior to Town Meeting and on the floor of the Town Meeting. NH RSA 39.

Board of Selectmen

Selectmen, the executive office of Local Government, are elected by the Local Legislative Body. Selectmen's responsibilities are broad, including financial and personnel management of town government, municipal law and code enforcement, and overseeing Town Meeting. Selectmen are typically designated to enforce the zoning ordinances, health codes, and building codes by provisions of those laws. NH RSA 41.

Note: **Municipalities large enough to be designated as "cities" install an elected mayor and city council to act as executive office and local legislative body, respectively, regarding land use controls.** Cities maintain Planning Boards, Zoning Boards of Adjustments, and Conservation Commissions the same as towns do with Selectmen and Town Meeting. Keene is the only Ashuelot Corridor town with a mayor and city council.

Planning Board

The Planning Board is one of three land use boards which cities and towns may establish by vote of the local legislative body. The historic commission and heritage commission are the other two. The fourth land use board, the zoning board of adjustment is established by law where ever a zoning ordinance is adopted. Planning Board members may be either appointed by local Selectmen or elected by local legislative body. Planning Boards are required to develop and **maintain municipal Master Plans.** Planning boards are also typically responsible for **amendments to the zoning ordinance.** In towns with zoning ordinances, Planning Boards may

also adopt regulations for the Board's use in **reviewing site plans** where a change of land use or expansion of existing use is proposed. Where site plan regulations exist all such proposals are subject to the Board's review and approval prior to issuance of building permits. Planning Boards may also develop and adopt subdivision review regulations with or without a zoning ordinance. Various: RSA 673 and 674.

Zoning Board of Adjustment

Zoning Board of Adjustments is established as a provision of any adopted zoning ordinance as board of **appeals for administrative interpretation of the spirit and intent of the zoning ordinance, for variances from explicit provisions of the zoning ordinance, and for special exceptions as provided for by the zoning ordinance**. Appeals and requests for special exceptions arise from applications for building permits or subdivision or site plan approval. Zoning Board members are either elected by local legislative body or appointed as prescribed by the local legislative body. The Zoning Board may grant a variance only if the Board finds that literal enforcement of the zoning ordinance will result in unique hardship to the applicant and that granting the variance is not contrary to public interest. Notice that diminished economic return may not constitute a hardship. Zoning Boards may also be designated to hear appeals regarding applications for building permits. RSA 674 and 676

Conservation Commission

Conservation Commissions are established by local legislative body to advise other town officials and boards regarding **the use and protection of natural resources** within their town. Commission members are appointed by the Selectmen or Mayor. State law prescribes more specific responsibilities to index open space and identify areas of aesthetic or ecological value including wetlands, and make recommendations for the protection or management of those areas to the Board of Selectmen. Conservation Commissions also have the opportunity to comment on applications for NH Wetlands Permits. RSA 36-A

Heritage Commission / Historic District Commission

Historic Commissions are established by local legislative body to advise other town officials and boards in matters of **inventorying and protecting the towns cultural resources**, primarily man-made features and their natural, historic, and aesthetic contexts. Historic Commission members are appointed by Selectmen or Mayor. Historic District Commissions are established by local legislative bodies where a historic district has been established. Historic District Commissions have responsibility to make recommendations for the adoption or amendment of a historic district ordinance and regulations. Various, RSA 673, 674 and 676.

Code Enforcement / Health Officer / Building Inspector

The Board of Selectmen is authorized to enforce building codes and zoning ordinances as well as a health officer to enforce public health laws and rules. The local legislative body may elect to establish a building inspector or other code enforcement officer to perform those duties under supervision of the Selectmen.

Relationship Between the Master Plan, Zoning Ordinance, and Site Plan & Subdivision Review

The municipal **Master Plan is a statement of policies for the use of land and other resources within a town.** Master Plans typically set forth goals and objectives for the future use of land and other resources with recommendations for a variety of regulatory and non-regulatory measures. The policies and recommendations of the Master Plan should be based on the findings of research into the historic, recent, and expected future conditions of various natural and social resources. Master Plans are the responsibility of Planning Boards, however, any residents can initiate and participate in the creating or revising a local Master Plan. Typically, Master Plans are updated by the Planning Board with cooperation of other local boards and the general public and often consultant services are used for research, mapping, and/or analysis. The local Master Plan is an official but advisory document which requires adoption by the Planning Board following a public hearing process.

Zoning is local law which establishes 1) standards for lot dimensions and 2) permitted uses for land within a town. Ideally, the Zoning Ordinance implements the future land use recommendations of the Master Plan. The Master Plan is the public policy which justifies the establishment of the lot standards and permitted uses required by the Zoning Ordinance. Zoning may also regulate the placement and characteristics of signs, the allowable extent of impermeable surfaces, and the emission of noise, light, or smoke from properties. The geographic boundaries of zoning districts, that is the lands where those district standards apply, may be either 1) fixed and defined by natural features, streets and roads, or property boundaries, or, 2) defined by the occurrence of certain conditions, such as wetlands or steep slopes. In the latter, the standards of “overlay districts” are invoked only where specified conditions are discovered. Zoning standards can be proposed by the Planning Board or by any other resident through petition to Town Meeting (submitted to Selectmen) with required public hearings (see RSA 39:3). Zoning Ordinances are adopted by vote of the local legislative body.

Subdivision and Site Plan Review Regulations are used by the Planning Board to review the specifications of proposed new lots created by subdivision and/or proposed new uses on a property or the expansion of an existing use. The review is to ensure compliance with local

and state requirements. Site Plan Review regulations are criteria by which the Planning Board determines if 1) the application contains sufficient information for the Board to review the application based on the provisions of the regulations and 2) the proposed change or expansion of use conforms to the spirit and intent of the zoning ordinance and the master plan. Site plan and subdivision review typically assess lot dimensions, environmental and historic resource conditions, erosion control and drainage plans, and the layout of roads and utilities.

Conservation Oriented Zoning Standards

Conventional zoning creates use districts with fixed boundaries where the properties within the boundaries are subject to the dimensional and use standards prescribed by the ordinance. District boundaries are often defined property lines, road, and town boundaries. Fixed boundary districts cannot address resource protection needs adequately. Historic or natural resources are often scattered across the landscape without regard to the geometry of political boundaries, property lines, or roads. **Overlay zoning was developed to protect dispersed but important resources. Wetlands, steep slopes, shoreland, and other areas with special geologic, hydrological, or ecological characteristics are best protected using overlay zoning.** The use standards for overlay districts are developed, approved, and administered in the same protocol used for conventional zoning. The difference is that the standards are only invoked and supersede the standards of fixed boundary districts where the special conditions occur.

Floodplain zoning deserves a special note. Many towns have floodplain zoning districts wherein local use standards conform to the Federal Emergency Management Administration's requirements for the federal flood insurance program. Property owners are not eligible for flood insurance benefits unless the town in which they are located enforces FEMA floodplain use standards. These standards were not designed as environmental protection measures. They are primarily intended to limit property damage and personal injury in the event of a flood. The standards address design and construction of building, fuel tanks, and septic systems in floodways - areas designated as susceptible to 100-year floods. Environmental benefits of this program are ancillary but real. For example, FEMA standards prevent the release of fuels, sewage, and debris during a flood. Towns can develop local floodplain protection standards in addition to the FEMA standards for the purpose of protecting natural resources of floodplains.

Cluster development is an innovative zoning technique which allows for smaller individual lot sizes created by subdivision with the stipulation that the overall development density for the entire development project conforms to the prevailing zoning district standards. This is accomplished by requiring the developer to set aside some percentage of the original property as open space. For example, if a district has a two-acre minimum lot size a developer could subdivide a twenty-acre forest property into ten building lots. That project would conform to the district density standard of one house for every two acres. It would also turn the entire twenty acres into front and back yards. If the town has **a general provision of the zoning ordinance** to

allow cluster development, the developer could create ten half-acre lots, use some additional acreage for a private road, and leave the remaining ten or twelve acres as undeveloped forest and

deeded as conservation land. The district density standard of one house for every two acres is maintained; the neighborhood, town, watershed retain some conservation land; and the developer has ten marketable properties.

Transfer of development rights is another innovative technique by which as a **general provision of the zoning ordinance** property owners or developers may increase the density or intensity of a land use on one property by decreasing the allowable density on another. This is accomplished by one property owner literally paying another property owner to transfer some quantity of density from the second property to the first. For example, a developer with designs for housing construction in a one-acre-minimum-lot-size district could pay another property owner in that district the difference in the value of the latter's undeveloped property under one-acre lot size zoning standards and, say, two-acre lot size standards. That transaction would restrict the latter's property to a lower density and allow the developer to increase the density in his housing development. This has applications in conservation if the town has areas or properties targeted for greenbelt development, for example. Town officials could facilitate the purchase of development rights from properties targeted for land conservation.

Historic districts are authorized by state statute and become jurisdictions with land use standards distinct from the town's prevailing zoning ordinance. While created under the same protocol as a conventional zoning district, historic districts can be subject to strict specifications for building design, exterior renovation, landscaping, and even paint colors in order to preserve the historic integrity of the district. Historic districts are typically village centers or industrial building complexes.

Ashuelot River Corridor Management Plan
Appendix 3. Directory of Assistance

Town Government

Each town is governed by officials as designated by the local legislative body (a.k.a. Town Meeting, or City Council). Local officials and boards whose roles include issues related to stewardship of the Ashuelot River Corridor include the Board of Selectmen, Planning Board, Conservation Commission, and Health Officer. Contacting the Town Clerk or Selectmen's Secretary is often the most efficient way to reach other local officials due to annual changes in town office business hours, meeting times for local boards, and the names of local officials.

There are several organizations that maintain directories of local officials, including Southwest Region Planning Commission (357-0557), NH Department of Transportation (271-3734), and the NH Municipal Association (1-800-852-3358).

Gilsum	Town Office 357-0320
Hinsdale	Town Office 336-5710
Keene	City Hall 357-0133
Lempster	Town Office 863-3213
Marlow	Town Office 446-2245
Sullivan	Town Office 847-3316
Surry	Town Office 352-3075
Swanzy	Town Office 352-7411
Washington	Town Office 495-3661
Winchester	Town Office 239-4951

Ashuelot River Regional Organizations & Agencies

Ashuelot River Local Advisory Committee

c/o Southwest Region Planning Commission
20 Central Sq., 2nd Floor, Keene, NH 03431
tele: 357-0557, FAX: 357-7440, e-Mail: jporter@swrpc.org
Jeff Porter, Senior Planner

Established under NH RSA 483-B, the LAC is authorized to develop and promote the Ashuelot River Corridor Management Plan and afforded the opportunity to review and comment on applications for environmental permits within the Ashuelot River Corridor. Principle interests are public education for stewardship of River Corridor resources and assistance to local land use boards regarding the same. The LAC is made up of representatives from the ten Corridor towns.

Antioch New England Graduate School

Environmental Studies Department
40 Avon St., Keene, NH 03431
tele: 357-3122
Kay Delaney, Practicum Coordinator

Antioch offers graduate programs in environmental studies and resource management. Antioch students have worked with government and private entities in a great variety of research, public education, and policy-making projects. Antioch faculty and interns are valuable resources for local conservation projects. (The Rachael Marshal Outdoor Learning Labs (director: Paul Bocko ext. 250, paul@anei.org) provide a learning atmosphere for students within the Ashuelot River Corridor)

Connecticut River Joint Commissions

P.O. Box 182
Charlestown, NH 03603
tele: 826-4880
Sharon Francis, Executive Director

The CRJC is established by the legislatures of NH and VT for the purpose of safeguarding the unique natural and cultural heritage of the Connecticut River Valley. The CRJC offers a grassroots support small grant program: the Connecticut River Partnership Program. Competitive Partnership grants fund local conservation and education activity in the Connecticut River watershed. The CRJC is active with the legislatures and environmental agencies of both states as well as at the federal level.

Connecticut River Watershed Council

15 Bank Row
Greenfield, MA 01301
tele: 413-772-2020
email: crwc@crocker.com
Tom Miner & Whitty Sanford, Co-Executive Directors

Public education and interagency networking regarding stewardship and environmental policy.

Keene State College Science Division

229 Main St.
Keene, NH 03431
tele: 352-1909
Dr. Gordon Leverse, Dean

The Science Division encourages internships and practical term-projects for undergraduate students. Students and faculty in the environmental studies and geography programs are especially interested in working with community-oriented conservation issues in the Ashuelot River watershed. Faculty conduct research in water quality and ecology of the Ashuelot River.

Harris Center for Conservation Education

King's Highway
Hancock, NH 03449
tele: 525-4073
Meade Cadot, Director

The Harris Center conducts a public education program with activities both at the Harris Center and in area schools. The Harris Center is also active in land conservation in the Monadnock highlands. Harris Center staff are an excellent resource in these subject areas.

Monadnock Conservancy

P.O. Box 337
Keene, NH 03431
357-0600, e-Mail: staff@monadnockconservancy.org
Diane Schott, President

The Conservancy's mission is to promote and facilitate land conservation for the preservation of natural and cultural heritage. The Monadnock Conservancy's range of interest includes Keene, Swanzey, Sullivan and Winchester in the Ashuelot Corridor. The Conservancy maintains a network of local members who represent the Conservancy to their respective towns, and vice-versa.

NH Fish and Game Department, Region 4

Route 9
Keene, NH 03431
352-9669

The Region 4 office of the NH Fish and Game Department is staffed by an officer whose principal duties are public safety and law enforcement. The District office can provide contact with other Department personnel, e.g. fisheries and game biologists.

Southwest Region Planning Commission

20 Central Square, 2nd Floor
Keene, NH 03431
357-0557

Provides local planning assistance; conducts regional planning activities; provides liaison between state and local interests; maintains and manages a repository of socio-economic, environmental, and geographic information; and participates in statewide policy and program activity in all matters regarding community planning. Serves 36 towns in Cheshire and Hillsborough Counties. Is one of nine NH regional planning agencies.

Upper Valley Lake Sunapee Council

77 Bank Street
Lebanon, NH 03766
448-1680

Provides local planning assistance; conducts regional planning activities; provides liaison between state and local interests; maintains and manages a repository of socio-economic, environmental, and geographic information; and participates in statewide policy and program activity in all matters regarding community planning. Serves 26 towns in Sullivan and Grafton Counties. Is one of nine NH regional planning agencies.

US Army Corps of Engineers, Surry Mountain

Surry Mountain Flood Control Dam and Otter Brook Flood Control Dam
352-4130

also: Technical Services
New England District
US Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Operates Surry Mountain Dam for flood control and manages federal lands of Surry Mountain Flood Control Reservoir for public recreation and wildlife habitat.

US Fish and Wildlife Service, Conte Refuge

The Great Falls Discovery Center
38 Avenue A
Turners Falls, MA 01376
413-863-0209

Implements research, habitat management, and public education regarding the purposes of the Silvio Conte Refuge for the Connecticut River Watershed. Refuge activity includes in-stream habitat protection for migratory fish in the Ashuelot River and tributaries.

County-Level Organizations & Agencies

Cheshire and Sullivan Counties Conservation District

Route 12, South, R1, Box 315
Walpole, NH 03608-9744
756-2988

USDA Natural Resources Conservation Service

Debby Hindman, District Manager

Cheshire County Cooperative Extension Service

800 Park Ave
Keene, NH 03431
352-4550
Lauren Bressett, Administrator

Statewide Organizations

Appalachian Mountain Club

P.O. Box 298
Gorham, NH 03581
466-2727

Activities include public education and political activity regarding environmental policy, land conservation, and environmental education. Maintains Appalachian Trail and trail amenities.

NH Audubon Society

3 Silk Farm Road
Concord, NH 03302-0516
224-9909

Activities include public education and political activity regarding environmental policy, land conservation, and environmental education. Organizes an annual migratory bird census in the Ashuelot River Watershed conducted by local volunteers.

NH Association of Conservation Commissions

54 Portsmouth Street
Concord, NH 03301
224-7867
Marjory Swope, Executive Director

Provides networking among NH Conservation Commissions through a quarterly newsletter and participates in legislative activity regarding environmental policy.

Ashuelot River Corridor Management Plan
Appendix 3. Directory of Assistance

NH Farm Bureau

295 Sheep Davis Road
Concord, NH 03301
224-1934
Donna Miller, Executive Director

NH Rivers Council

54 Portsmouth Street
Concord, NH 03301
228-6472
email: c_paulsen@nhrivers.org
contact: Carl Paulsen

Public education and networking among grassroots organizations, state and federal agencies and legislators regarding river protection policy and programming; supports NH Rivers Management and Protection Program implementation.

NH Timberland Owners Association

54 Portsmouth Street
Concord, NH 0331
224-9699

Landowner association participating in public education and political activities regarding land management, timber management and marketing, and public policy.

NH Youth Conservation Corps

P.O. Box 550
Charlestown, MA
543-9196

Organizes and manages student work teams for conservation activities.

NH Wildlife Federation

54 Portsmouth Street
Concord, NH 03301
224-5953

Sierra Club, NH Chapter

54 Portsmouth Street
Concord, NH 03301
226-9196

Society for the Protection of NH Forests

54 Portsmouth Street
Concord, NH 03301
224-9945

Activities include public education and political activity regarding environmental policy; promotes land conservation and forest management; owns and manages conservation land.

Ashuelot River Corridor Management Plan
Appendix 3. Directory of Assistance

Trout Unlimited

18 Low Street
Concord, NH 03301-4902
226-3436

Activities include public education and political activity regarding stream protection. Also conducts stream habitat improvement and restoration projects and promotes stewardship.

State Government Agencies

NH Department of Environmental Services

6 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095
271-3503

NH Rivers Management and Protection Program

David Neils, Rivers Coordinator

Volunteer River Assessment Program

Beth Malcolm, Coordinator

NH Department of Development and Economic Resources

P.O. Box 1856

Concord, NH 03302

George Bald, Commissioner

Bureau of Forests and Lands

271-2215

NH Natural Heritage Inventory

271-3623

NH Department of Transportation

Bureau of Environment

1 Hazen Drive, P.O. Box 483

Concord, NH 03302-0483

271-3474

William Hauser, Administrator

NH Fish and Game Department

2 Hazen Drive

Concord, NH 03302

271-3421

Wayne Vetter, Executive Director

Eric Aldrich, Public Affairs

NH Governor's Office of Cultural Affairs

20 Park Street

Concord, NH 03301

271-2540

Van McLeod, Commissioner

NH Office of State Planning

2 1/2 Beacon Street
Concord, NH 03301
271-2155
Jeffrey Taylor, Director

NH Division of Historic Resources

P.O. Box 2043
Concord, NH 03301
271-3483
Nancy Muller, Director

Federal Government Agencies

US Army Corps of Engineers, New England

Technical Services
New England District
US Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

US Environmental Protection Agency

Team New Hampshire

John F. Kennedy Federal Building
Boston, MA 02203-2211
617-918-1581; e-mail: deloi.carl@epamail.epa.gov

US Fish and Wildlife Service, New England

Regional Office
300 Westgate Center Drive
Hadley, MA 01035-9589
413-253-8200
email: fw5ea_web@fws.gov

US Geologic Survey, New Hampshire

361 Commerce Way
Pembroke, NH
226-7800
Brian Mrazik

Conducts research, maintains data and issues reports regarding geology and hydrology including stream flow data, ground water distribution, and water use.

Ashuelot River Corridor Management Plan
**Appendix 4. Regulations Affecting the
 Ashuelot River as a Designated River**

**EXISTING FEDERAL AND STATE LAWS AND REGULATIONS
 AFFECTING DESIGNATED RIVERS
 January 1998**

TOPIC	FEDERAL	STATE
I. Water quality		
I A. Protection of water Quality	<p>Clean Water Act: 1972 (3 USC 1251-1376) Restore and maintain the chemical, biological and physical integrity of U.S. waters.</p> <p>Wild and Scenic Rivers Act (16 USC Chapter 28) By executive order, all federal agencies must make all reasonable efforts to avoid negative impacts to all rivers designated as Wild and Scenic and those listed in the Nationwide Rivers Inventory as potential Wild and Scenic Rivers.</p>	<p>RSA 484-A Water quality shall be maintained at class A or B standards.</p> <p>RSA 483 Water quality shall be maintained at Class A or B for rivers designated as "natural" and Class B for rivers designated as "rural", "rural -community" or "community".</p> <p>RSA 482-A Permit from DES Wetlands Bureau required for excavation, dredge, fill or construction in or on any banks, flat, marsh or swamp in and adjacent to any waters of the state.</p> <p>Env-Wt 100-800 NHDES Wetlands rules</p> <p>Env-Ws 410: Ground water protection rules</p> <p>Env-Ws 430: Surface water quality standards</p> <p>Env-Ws437: Protection of surface waters from degradation by pollutant discharge.</p>
I B. Sources of erosion and sedimentation	<p>Soil Conservation Act (16 USC 590a) Directs Natural Resource Conservation Service to prevent soil erosion through local regulations and watershed improvement projects.</p> <p>Clean Water Act (33 USC 1239) relates to regulation of nonpoint source pollution.</p>	<p>RSA 485-A:17 Alteration of terrain permit, required for major earth disturbance.</p> <p>Env-Ws 415: Rules governing alteration of terrain (site specific) permits.</p>
I B 1. Lumber harvesting practices		<p>RSA 227-J:9 No more than 50% of the basal area of trees shall be cut; leaving a well distributed stand of healthy growing trees within 150 feet of any fourth order or higher stream, or within 50 feet of any other stream which normally flows throughout the year, unless prior written consent of the director of the Division of Forest Lands or the director's agent is obtained and all other state and local permits have been secured.</p> <p>RSA 485-A:17 Best Management Practices required in timber harvesting.</p> <p>RSA 482-A:3V Forest Management limited to minimum impact activities.</p> <p>Res 5401.02(a) A permit is required to float timber on surface waters of the state.</p>
I B 2. Road, bridge and building construction	<p>Rivers & Harbors Act of 1899: (33 USC 401)</p> <p>Clean Water Act (33 USC 1344) Need federal permit to construct dams, bridges, piers, etc., in any navigable water.</p> <p>Wild and Scenic Rivers Act (16USC Chapter 28) By executive order, all federal agencies must make all reasonable efforts to avoid negative impacts to all rivers designated as Wild and Scenic and those listed in the Nationwide Rivers Inventory as potential Wild and Scenic Rivers.</p>	<p>RSA 482-A:3 Construction of structures in or adjacent to wetlands or surface water require permit from DES Wetlands Bureau.</p> <p>Env-Wt 100-800 DES Wetlands rules.</p>
I B 3. Land tilling near the river		

Ashuelot River Corridor Management Plan
**Appendix 4. Regulations Affecting the
 Ashuelot River as a Designated River**

TOPIC	FEDERAL	STATE
IB 4. Dredge and fill activities	Clean Water Act (33 USC 1344) Establishes permit system for dredge and fill activities in navigable waterways. Wild and Scenic Rivers Act (16 USC Chapter 28) By executive order, all federal agencies must make all reasonable efforts to avoid negative impacts to all rivers designated as Wild and Scenic and those listed in the Nationwide Rivers Inventory as potential Wild and Scenic Rivers.	RSA 485-A:17 A permit is required for any terrain alteration in or on border of surface waters or which will alter natural runoff. RSA 482-A Permit from DES Wetlands Bureau required for excavation, dredge, fill or construction in or on any banks, flat, marsh or swamp in and adjacent to any waters of the state. RSA 483:9 No channel alteration activities shall be allowed in rivers designated as "natural". DES shall encourage the use of native vegetation to stabilize stream banks of designated "rural", "rural community" and "community" rivers. Env-Wt-100-800 DES Wetlands rules.
I B 5. Borrow pits, sand and gravel operations, removal of material from the corridor		RSA 155-E A permit from the local Zoning Board of Adjustment is required. No excavations within 75 feet of any navigable river or within 25 feet of any other stream which normally flows throughout the year. RSA 485-A:17 Alteration of terrain permit required for major earth disturbance. Env-Ws 415 Rules governing alteration of terrain (site specific) permits.
I C 1. Septic systems		RSA 485 A:29 Permit is required prior to system construction. Inspection required before system covered or used. Env-Ws 1000 Individual sewage disposal system design rules. Env-Ws 700 Sewerage and waste system treatment system design standards.
I C 2. Setbacks for septic systems		RSA 485-A Submission and approval of plans and specifications for septic systems. Env-Ws1008.03 Sewage disposal systems shall be at least 75 feet from surface water. Locate septic system no closer than 125 feet from wetlands or water course.
I C 3. Septage and sludge disposal	Clean Water Act (33 USC 1345) Relates to disposal or use of sewage sludge	Env-Ws 800 Regulations for removal, transportation, and disposal of septage and sludge.
I D. Pollution from agricultural, residential, municipal and industrial sources	Soil conservation Act (16 USC 590a) Directs Natural Resource Conservation Service to prevent soil erosion through local regulations and watershed improvement projects. Clean Water Act (33 USC 1342) Requires NPDES permit for point discharge Clean Water Act (33 USC 1329) Relates to regulation of nonpoint source pollution.	RSA 485-A Water pollution and waste disposal regulations. RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers
I D 1. Pesticides		RSA 430 All pesticide applications must comply with rules adopted by Pesticides Control Board, NH Dept. of Agriculture. RSA 483 Setback requirements for certain fertilizers. RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers. (Agricultural use is exempt). Pes-1001 Restrictions on the use of pesticides to protect ground and surface waters.

Ashuelot River Corridor Management Plan
Appendix 4. Regulations Affecting the
Ashuelot River as a Designated River

TOPIC	FEDERAL	STATE
I D 2. Manure spreading and fertilizers		RSA 431:33-35 Manure and chemical fertilizer handling must be done in accordance with NH Dept. of Agriculture Best Management Practices. RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers. (Agricultural use is exempt).
ID 3. Storage facilities for petroleum and/or hazardous materials (under and above ground)		Env-Ws 411 Rules for underground storage and handling of oil and petroleum liquids. Env-Wm-1401 Control of underground storage facilities to prevent and minimize contamination of water. Env-Wm-1402 Control of aboveground petroleum storage facilities to minimize contamination of water.
I D 4. Road Salt		RSA 485-C:11 Outdoor storage of road deicing chemicals is prohibited in designated wellhead protection areas. RSA 485-C:12 Prohibits certain uses within any wellhead protection area classified as GAA, including siting or operating a hazardous waste disposal facility or landfill, snow dump, junk or salvage yard or wastewater or septage lagoon, outdoor storage of road salt or other deicing chemicals in bulk.
I D 5. Disposal of plowed snow		RSA 485-A:13, I(a) Prohibits discharging of wastes into surface waters without a permit RSA 485-C:12 Snow dumps are prohibited in designated wellhead protection areas. RSA 485-C:12 Prohibits certain uses within any wellhead protection area classified as GAA, including siting or operating a snow dump.
I D 6. Runoff from roads and parking lots	Clean Water Act (33 USC 1342) Establishes regulation of Municipal and industrial storm water discharges.	RSA 485-A:17 Alteration of terrain permit requirements include practices to mitigate the effects of urban runoff.
I D 7. Landfills; solid waste disposal, recycling depots; oil-collecting tanks		RSA 483 No new solid waste landfills within 1/4 of mile designated "natural" rivers or within 500 year floodplain of "rural". "rural-community" or "community" rivers. No expansion of existing landfills within 500 year floodplain of designated "natural" rivers. Env-Wm 1901 Solid Waste Management Rules.
I D 8. Timber operations - slash and mill waste		RSA 485-A:151 Litter (garbage, crap metal, old cars, trees, etc.) shall not be disposed of in, on the ice over, or on the banks of surface waters. RSA 227-J:10 No disposal of slash & mill waste within 50 feet of any navigable river, within 25 feet of any stream which will float a canoe at normal water level or in any stream which normally flows throughout the year. RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers.

Ashuelot River Corridor Management Plan
Appendix 4. Regulations Affecting the
Ashuelot River as a Designated River

TOPIC	FEDERAL	STATE
I D E. Water quantity, including water withdrawals	Federal Power Act (16 USC 791) Every hydroelectric project on a navigable stream requires a Federal Energy Regulatory Commission permit. Clean Water Act (33 USC 404) Permits for dams may be conditioned to assure sufficient flows and restrict withdrawals for the protection of fish and wildlife. Wild and Scenic Rivers Act (16 USC Chapter 28) By executive order, all federal agencies must make all reasonable efforts to avoid negative impacts to all rivers designated as Wild and Scenic and those listed in the Nationwide Rivers inventory as potential Wild and Scenic Rivers.	RSA 483 No interbasin transfers area allowed. A protected instream flow level shall be established for each designated river. No new dams are allowed on rivers designated as "natural", "rural" or "rural-community" rivers. Env-Wr 700 Water uses over 20,000 gpd must be registered and report usage.
I D E. Water quantity, including water withdrawals	Federal Power Act (16 USC 791) Every hydroelectric project on a navigable stream requires a Federal Energy Regulatory Commission permit. Clean Water Act (33 USC 404) Permits for dams may be conditioned to assure sufficient flows and restrict withdrawals for the protection of fish and wildlife. Wild and Scenic Rivers Act (16 USC Chapter 28) By executive order, all federal agencies must make all reasonable efforts to avoid negative impacts to all rivers designated as Wild and Scenic and those listed in the Nationwide Rivers Inventory as potential Wild and Scenic Rivers.	RSA 483 No interbasin transfers are allowed. A protected instream flow level shall be established for each designated river. No new dams are allowed on rivers designated as "natural", "rural" or "rural-community" rivers. Env-Wr 700 Water uses over 20,000 gpd must be registered and report usage.
II. Scenic Appearance		
II A. Open space management		RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers.
II B. Riparian buffer zones		RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers.
II B 1. Setbacks for buildings and roads		RSA 482-A:26 No structure extending beyond the shoreline of public water may be used as a dwelling. RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers.
II B 2. Permitted uses		RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers.
II B 3. Lot sizes and river frontage		RSA 485-A:39 Waterfront property sale and site assessment study.
II B 4. Building heights		
II B 5. Mobile home regulations		RSA 674:32 Manufactured housing can be regulated but not excluded from a municipality.
II B 6. Junk yard restrictions		RSA 236:111-129 Junk-yard regulations. RSA 236:90-110 Requirements for control of junkyards and automotive recycling yards.
II C. Location of roads and parking lots		RSA 230; RSA 231 Layout, construction and maintenance of state highways and city, town and village and district highways. RSA 47:17; RSA 48-B Sidewalks, parking and use of public ways.

Ashuelot River Corridor Management Plan
Appendix 4. Regulations Affecting the
Ashuelot River as a Designated River

TOPIC	FEDERAL	STATE
II D. Building material choices		
II E. Timber operations-cutting for views		RSA 483-B Comprehensive Shoreland Protection Act: Minimum setbacks for certain rivers
II F. Signs		RSA 236: 69-89 Regulation of outdoor advertising and signs.
III. Recreation		
III. A Water Sports		RSA 233-A Statewide Public Access Program. RSA 270:29 Prohibits motorized watercraft on streams in the White Mountain National Forest. RSA 270:115 and 120 Specific restriction on the Connecticut River RSA 270:73-74 Restricts the operation of skicraft. RSA 270-D:2 General rules for vessels operating on water. RSA 270:121 Specific restriction on the Piscataquog River RSA 482-A Wetlands permit required for dock construction. RSA 483:9 No motorized watercraft on designated" natural" rivers. On other designated river, headway speed only within 150 feet of shore. Env-Wt 100-800: DES Wetlands rules. Saf-C-402 restrictions on specific water bodies. Saf-C-404 Boating rules. Saf-C-407 Rafting rules. Saf-C-413 Water event and slalom course permits.
III B. Camping		
III C. Trail networking		RSA 215-A Off Highway Recreation Vehicle regulations.
III D. Barrier-free access	American with Disabilities Act (42 USC Chapter 126)	RSA 275-C Governor's Commission on Disabilities.
IV. Wildlife and Fisheries		
IV A. Protection of Wildlife and Fisheries	Dept. of Transportation Act of 1966: (49 USC 1651-59, Section 4 (f)) No US Dept Transportation projects are allowed on public land important for wildlife, recreation area or wildlife and waterfowl refuge of national, state or local significance or historic properties unless there is no prudent and feasible alternative and there has been all possible planning to minimize harm. Fish and Wildlife Coordination Act: (16 USC 661-661c) Whenever a river is altered by a water resource development project, steps should be taken to conserve wildlife resources.	RSA 207:19-21 Angling and restrictions of fishing.
IV B. Wildlife		RSA 208 Game animals. RSA 209 Game birds and pigeons. RSA 210 Fur-bearing animals. RSA 212-B Nongame Species Management Act

Ashuelot River Corridor Management Plan
**Appendix 4. Regulations Affecting the
 Ashuelot River as a Designated River**

TOPIC	FEDERAL	STATE
IV C. Fisheries		RSA 211 Fish, shellfish, lobsters and crabs. RSA 212 Propagation of fish and game. RSA 213 Atlantic marine fisheries including salmon.
V. Rare communities and species		
V A. Unique natural communities; threatened and endangered species	Endangered Species Act (16 USC 1531-43)	RSA 227-C Governs identification and protection of state historic resources and properties.
VI. Historical and archaeological features		
VI A. Historical Sites	National Register of Historic Places (16 USC 470a) Dept. of Transportation Act of 1966: (49 USC 1651-59, Section 4 (f)) No US Dept Transportation projects are allowed on public land important for wildlife, recreation area or wildlife and waterfowl refuge of national, state or local significance or historic properties unless there is no prudent and feasible alternative and there has been all possible planning to minimize harm. National Natural Landmarks (16 USC section 463) In some instances, there may be National Natural Landmarks on some rivers listed on the Nationwide Rivers Inventory.	RSA 227-C Governs identification and protection of state historic resources and properties.

Statement of Purpose

It is a purpose of this analysis to provide a context for discussion of expected demand for development and the risk of degradation of natural and cultural resources due to existing or potential development. Existing land use and soil conditions in the Ashuelot River Corridor were analyzed to provide the Ashuelot River Local Advisory Committee with an understanding of the current and possible future conditions of development in the Corridor. The Committee will use this analysis as part of a planning effort to guide change in the Corridor with a goal of minimizing loss of resources and maximizing resource values.

Approach

Land Use

Land use was inventoried for the project area which is the land area within 1/2-mile of each river bank. The inventory was conducted during Summer 1997. ArcInfo™ Geographic Information System (GIS) was used to quantify the observed land use.

Existing land use was inventoried by field observation during 1997. Identified land uses were recorded on municipal tax maps (a.k.a. parcel maps). Observed land uses were classified using a conventional classification scheme: Single-Family Residential, Commercial, Industrial, Public/Institutional¹, Active Agriculture, Conservation, Other Undeveloped, and Mixed-Use Village Development (several contiguous developed properties, each less than 5 acres). For the purposes of this analysis land use was measured to determine the amount of land currently under the influence of development. The phrase “under the influence of development” means the alteration of natural conditions, principally under the precepts of hydrology and ecology. Alterations may include alteration of topography and drainage patterns, introduction of impervious surfaces and alteration of infiltration and runoff rates, deforestation or other alteration of vegetation, displacement of natural plant and animal communities, and introduction of exotic species or pollutants. Also, the affects of contiguous development were accounted for by quantifying land use of contiguous developed properties differently from single developed properties isolated among undeveloped properties.

The Mixed-Use Village Development class was used to indicate areas of dense residential and/or commercial land use. These areas are generally considered to be potential non-point source pollution threats due to a concentration of household and landscaping chemicals, motor vehicles, and the possibility of other chemicals used in business and industry.

On developed properties less than five acres in size, the land use was ascribed to the entire property, that is the entire property was considered to be under the influence of the type of development observed there. On properties larger than five acres, observed land use was ascribed to an area of influence less than the total property area as either a default of two acres or some other areal extent meant to approximate actual area of influence based on field observation. The two-acre default was typically used for single-family homes in a rural setting.

¹ public/institutional = local, state or federal government uses; or; tax exempt organizational uses, e.g. fraternal organization, church, or historical society

Ashuelot River Corridor Management Plan

Appendix 5. Land Use & Soil Conditions

The land use inventory and tax maps were automated as GIS data bases. Land use was quantified as acres by class, by count of properties by class, and as a percent of total Corridor land area. The land use inventory was also presented in a map: “Existing Land Use of the Ashuelot River Corridor.”

Soil Conditions

Information on soil conditions and other landscape variables that are known to impose limitations on development as reported by the USDA Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) 1984 Soil Surveys for Cheshire County was analyzed for the study area using ArcInfo™ Geographic Information System. Soil conditions are used here as indicators of limitations to or favorability for future development.

This analysis is based on the NRCS tables that qualify soils for limitations to “Building Site Development,” “Sanitary Facilities,” and Woodland Management.” Each of these tables qualify soil types by an array of subordinate variables as follow:

Building Site Development

Soil	Shallow Excavation	Dwellings without Basements	Dwellings with Basements	Small Commercial Buildings	Local Roads and Streets	Lawns and Landscaping
76B Marlow	Moderate: dense layer	Slight	Moderate: wetness	Moderate: slope	Moderate: frost action	Slight

Sample entry from table 10. Cheshire Co.

NRCS Survey Soil Unit Code and Name. The Unit Code indicates the type of Soil by number (76). There are 264 different soil types in the Corridor. The Code also indicates the slope of land by letter, generally as: A= 0-5%, B= 5-8%, C=8-15%, D=15-25%, E > 25%.

Slight = generally favorable to development; Moderate = some special considerations may be required to overcome limitations; Severe = substantial costs and other special considerations may be required to overcome limitations of soil conditions or site features

These descriptors of soil or site limitations were not used in this analysis.

Sanitary Facilities

Soil	Septic tank absorption field	Sewage lagoon areas
76B Marlow	Severe: percs slowly	Moderate: seepage, slope Suitability for lagoons was not used in this analysis.

Sample entry from table 11. Cheshire Co.

Woodland Management

Soil	Erosion	Equipment	Seedling	Windthrow	Plant
------	---------	-----------	----------	-----------	-------

Ashuelot River Corridor Management Plan

Appendix 5. Land Use & Soil Conditions

		Hazard	Limitations	Mortality	Hazard	Competition
Sample entry from table 7. Cheshire Co.	75B Marlow	Slight	Slight	Slight	Moderate	Moderate

NOTE: Table 7. Woodland Management and Productivity appearing in the Soil Survey contains fields not shown or used here: Ordination Symbol, Common Trees, Site Index, Productivity Class, and Trees to Plant.

A score was calculated for each soil type for each of the three variables: Building Site Development, Sanitary Facilities, and Woodland Management:

1. Scores were calculated by assigning the values 0, 50, and 100 to the qualifiers slight, moderate, and severe, respectively.
2. Average scores were calculated for each soil type within each table.
3. Average scores for each soil type within each variable were reclassified as slight, moderate or severe using a natural groupings algorithm for each variable as shown below.

Variable	Score	Reclassification
Building Site Development	0 - 50	Slight
	51 - 65	Moderate
	66 - 100	Severe
Sanitary Facilities *	0	Slight
	50	Moderate
	100	Severe
Woodland Management	0 - 20	Slight
	21 - 60	Moderate
	61 - 100	Severe

* Single scores were used here due to soils being qualified for only one subordinate variable: septic tank absorption field.

The qualifiers “slight,” “moderate,” and “severe” indicate a level of effort required to accomplish the specified activity, such as site development, timber harvest, or installation of a septic absorption field. That effort may be required during or after construction and may include special considerations regarding engineering, construction, maintenance, or cost of a project. These qualifiers may also provide an indication of the level of risk of environmental damage, including loss of soil potential, loss of soil, and contamination of ground or surface waters, as a result of a specified activity. The qualification of a soil type as having slight limitations to building site development does not free a developer from soil erosion control practices before or after construction and likewise a severe limitation does not mean that construction there is not possible, only that special considerations or precautions will be necessary.

Ashuelot River Corridor Management Plan

Appendix 5. Land Use & Soil Conditions

Reclassified soils were analyzed for arial extent as acres and as percent of Corridor land area. The results of this soils analysis were also presented in a map series for the Ashuelot River Corridor.

Findings

The total area of the Ashuelot River Corridor is 52,486 acres. This includes 3,455 acres of surface water (rivers, streams, lakes and ponds) and about 4,069 acres of wetlands, leaving about 44,962 acres of land.

Land Use

The land use inventory revealed that about 51% of the Corridor land area is currently undeveloped. Public and institutional lands was the most extensive land use, occupying 10,405 acres (48% of all developed land) within the Corridor. Residential development occupied 7,438 acres (34% of developed land) with 852 properties involved while Mixed-use village development occupied only 708 acres (4% of developed land) but involved 1,582 properties. Active Agriculture occupied 2,243 acres (10% of developed land) of land on 77 properties. Results of the inventory are shown in Figure 1. and the map: “Ashuelot River Corridor Existing Land Use Summer 1997.”

Inspection of the land use inventory map shows that most development occurs within several hundred feet of state and major local roads. Village development tends to be adjacent to the Ashuelot River. Eight of the ten Corridor municipalities have their village centers adjacent to, if not centered on the Ashuelot River, with Washington and Lempster being the exceptions. That part of the City of Keene found within the Corridor represents the largest single extent of Mixed-Use Village Development in the Corridor. West Swanzey, Winchester, and Hinsdale also have well-defined village areas with residential, commercial and industrial land use in the Corridor.

Active agriculture occurs in only several isolated patches of considerable size. Most of the 2,243 acres of active agricultural land in the Corridor is attributable to three areas: hay production in the U.S. Army Corps Surry Mountain Flood Control land; corn and some vegetable production north and west of downtown Keene; hay and pasture on the Brown farm in West Swanzey; and pasture, hay and corn production in Winchester. Scattered small hay fields and pastures are common in the Corridor but represent a small percentage of the Corridor land use and land area.

Public land use accounts for about 48% of the Corridor developed land and 23% of the Corridor land area. These lands include municipal, state and federal property as well as other tax exempt properties such as churches. The Surry Mountain Flood Control reservoir and attendant recreation area represents a considerable part of the lands under public land use. The extent of the City of Keene’s public recreation land in the Corridor also warrants notice.

An additional variable investigated in the land use study was the extent and distribution of lands subject to some sort of legalistic restrictions on future development, conventionally known as conservation lands. A query of the NH GRANIT 1994 “Protected Lands” data base provided information shown in Figure 1. and Figure 2.: 9,474 acres of land in the Corridor are under some sort of conservation restriction, which represents 21% of the total land area. There is caveat about the conservation data to be understood, that being that one category of “protection” in the

Ashuelot River Corridor Management Plan

Appendix 5. Land Use & Soil Conditions

GRANIT data base is lands under public ownership. Some of those lands are truly conservation lands, such as state and municipal parks. This category also includes lands that are in public ownership for a variety of other reasons and may be subject to development by the public or disposal to private ownership and subsequent development.

Soil Conditions

The soils analysis results are presented in Figure 3. as the number of acres by class and level of limitations, and as percent of total land area by class and level of limitations. NOTE: the land area for the soils analysis is not equivalent to that for the land use study due to the absence of Sullivan County soils data.

The vast majority of land area is considered to have severe limitations to building site development (80%), installation septic tank absorption fields (90%), and woodland management activity (83%). The soils analysis map series illustrates well the vast extent of these restrictions. The presence of high water table, steep slope, shallow bedrock, and/or susceptibility to erosion are the principal environmental factors responsible for the severe limitations.

Land with moderate or slight limitations together represent between 10% and 20% of the Corridor land area. Land with moderate limitations tends to occur in areas that are currently developed, particularly as village areas. Soils with moderate limitations tend to occur on low lying, low relief lands of the valley floor. Soils with slight limitations tend to occur sporadically as isolated patches of 5 to 50 acres.

Summary

The findings of this study indicate that existing development with attendant environmental impacts tends to occur near the Ashuelot River rather than in upland areas within the Corridor. Commercial and industrial development is infrequent outside Village areas. Residential development is evenly distributed along roads in the Corridor, especially from Marlow village south. With this distribution comes equally evenly distributed environmental impacts.

The distribution of existing land use reflects the findings of the soil analysis: much of the Corridor has some limitations to development. Development is concentrated in areas with slight or moderate limitations. Throughout much of the Corridor, large areas currently absent of development are coincidentally known to have limitations to development principally imposed by steep slopes and wetlands.

Measuring the extent and magnitude of existing development and limitations to development imposed by soil conditions should be part of public and private decisions about the appropriateness of land use types and densities throughout the Corridor as well as a being a basis for developing and implementing environmental management tools. For example, the Ashuelot River Local Advisory Committee has identified a need for non-point source pollution prevention in the Corridor. The findings of this study can be used to work with local officials and property owners to develop prevention measures where an imminent need is identified.

Ashuelot River Corridor Management Plan

Appendix 5. Land Use & Soil Conditions

The land use and environmental conditions studied here are sound basic indicators for guiding environmental management decisions and land use controls. There are other equally influential factors which affect existing conditions and will be principal determinants of future development conditions: decision-making of private land owners and the prevailing economic environment. Much of the land area of the upper Corridor is undeveloped and under private ownership as large properties (measured in the 100's and even 1,000's of acres). The fate of privately owned undeveloped land is ultimately in the hands of the owners. None of the information provided in this study indicates that development of currently undeveloped land or increased development densities on currently developed land is impossible. The appropriateness of development and the implementation of land use controls and environmental management tools are public policy decisions and, as such, rely on a shared belief among the general public of a need for control or management.